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First Looks 20 New Utilities to Extend
And Expand Your Windows 95 System

NETWORK EDITION

Upgrading from NetWare 3.12
Should You? How Do You Do It?

Windows 95

**And How to
Make It Easy!**

INSTALLING

BOOTING UP

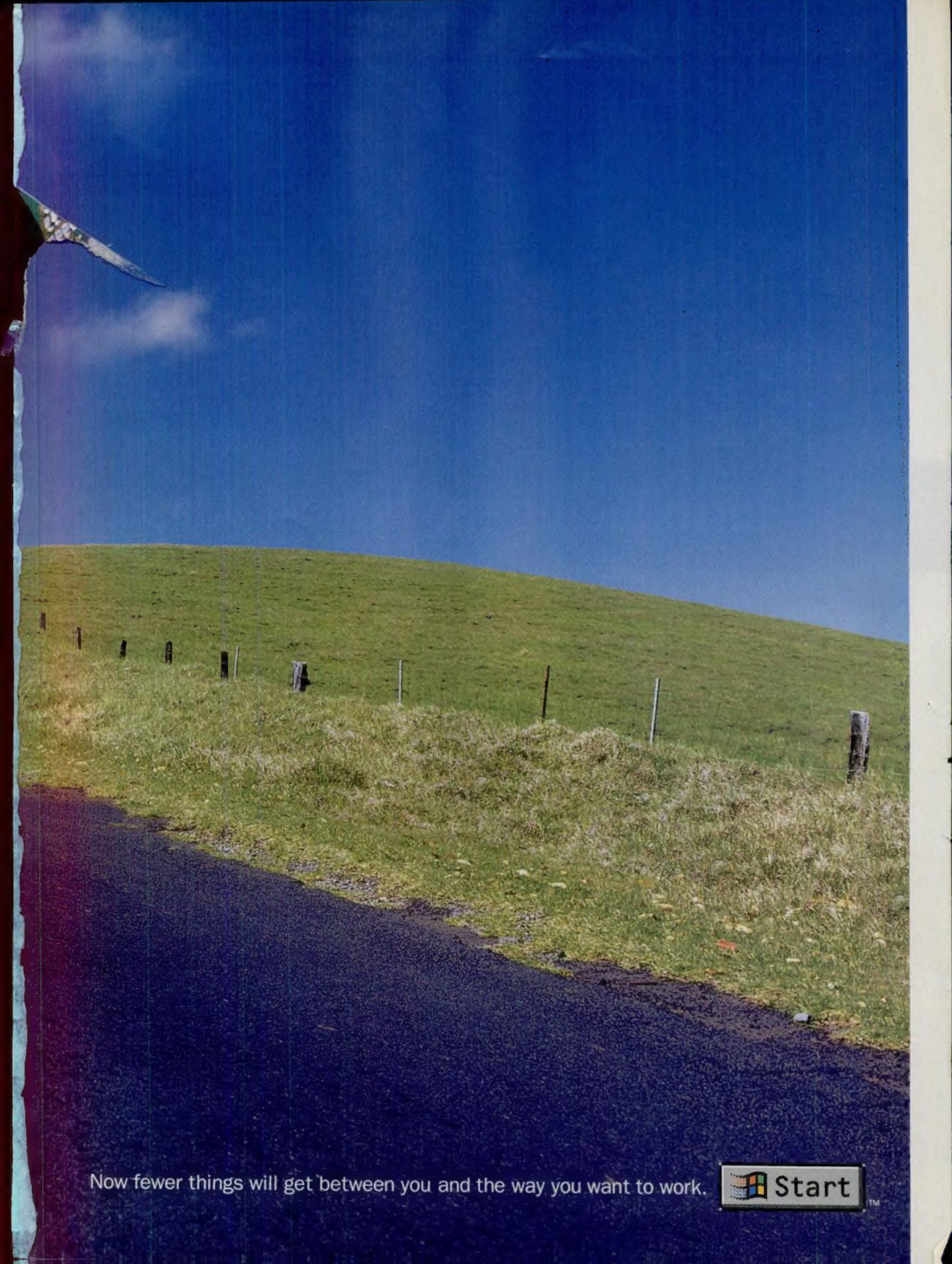
NETWORKING

GOING MOBILE

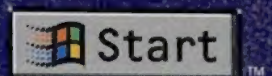
This **wide-open**

road brought to you by new Microsoft Office





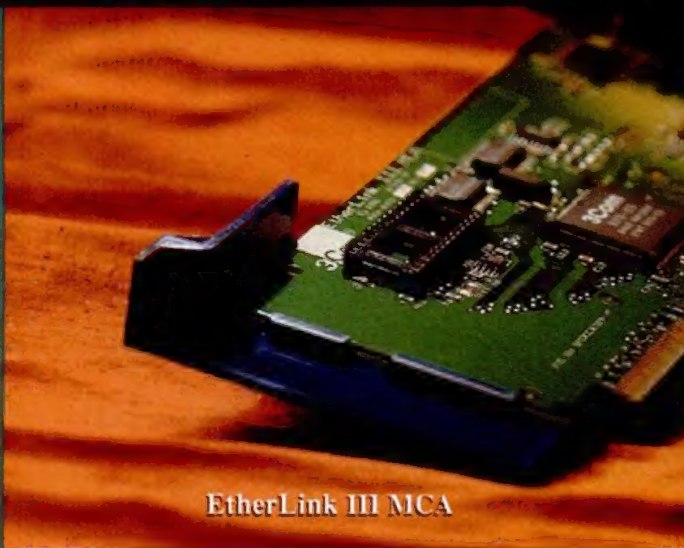
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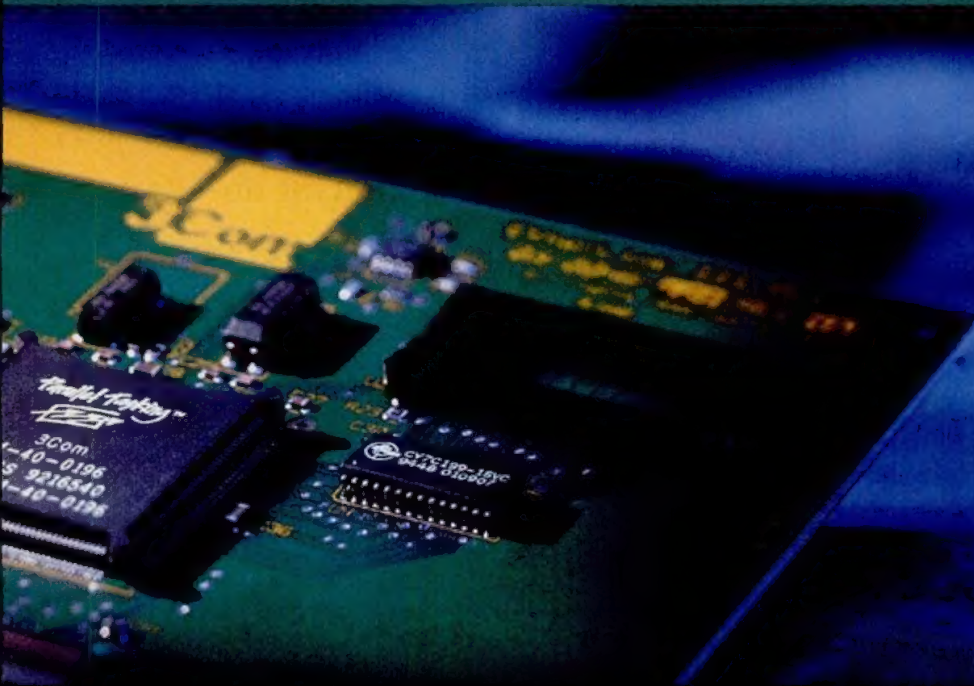
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Inside

W

hat does a technical director do? At PC Magazine Labs, our four technical directors wear all sorts of hats. They keep a keen eye on the underlying technology in various categories, oversee the development of testing scripts,

perform testing, read stories for technical accuracy, and sometimes write stories. This issue is a good example.



Nick Stam

Nick Stam, our hardware technical director, has been instrumental in all of our coverage of PCs and CPUs. A few weeks back, he did some fundamental analysis of the P6 and how it would work with 16- and 32-bit applications. This issue, he worked with project leader Rich Fisco to develop a series of tests for comparing the PowerPC with the Pentium.



Ben Gottesman

Over on the software side, technical director Ben Gottesman spent most of his summer with Windows 95, Windows NT, and OS/2, overseeing thousands of hours of operating-system testing. A maven of groupware and shared applications, he oversaw development of testing for this issue's document management story, working with project leader Jeff Mace.

The complex world of networking technology falls in the

bailiwick of Rob Lipschutz, who provides technical leadership for our networking teams based on the West Coast. Rob, working with project leader Jeff Witt, oversaw our months of testing network operating systems used as application servers.

Our newest technical director is Larry Seltzer, who just joined us following stints at *Windows Sources* and *PC Week*. A long-time technical

analyst with interests in all areas of technology, Larry will be working primarily with Ben and our project leaders on software projects. You can see his writing in our cover story on Windows 95.

Nick, Ben, Rob, and Larry work with Jim Galley, executive director of PC Magazine Labs, and with Steve Buehler, our West Coast labs director, as well as with our talented project leaders, to create and oversee the labs-based testing at the core of *PC Magazine*.—Michael J. Miller



Rob Lipschutz

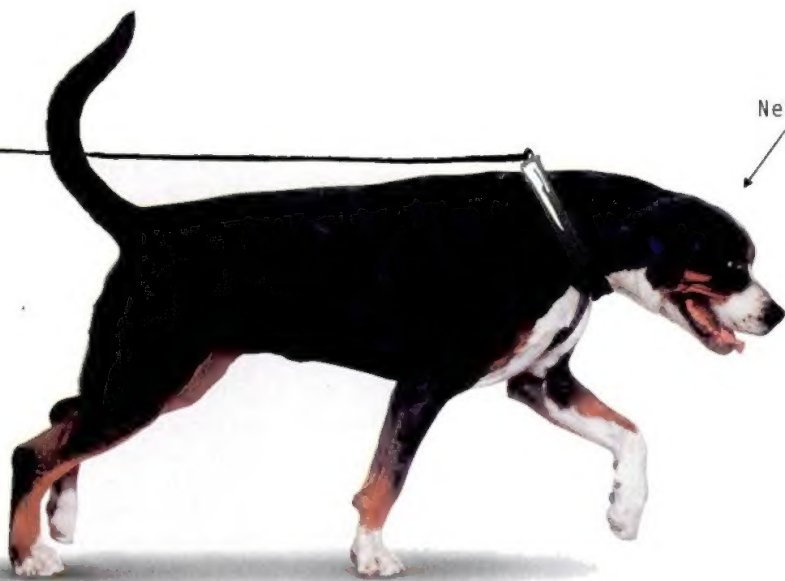


Larry Seltzer

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You've maxed out NetWare.
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Network



And so do the analysts at D.H. Brown. In a study released this June, they ranked Solaris™ as the best enterprise network operating system*. Ahead of Windows NT™. And above NetWare®. Then again, why wouldn't they? After all, Solaris provides serious power you can add to your PC workgroups. While protecting your NetWare and Windows investments. And because Solaris is optimized for Pentium™ and x86 servers, your PC users will have access to information throughout the company faster than ever before. From almost any 32-bit database you're running. It even helps manage your multiple LANs from any single location, and lets you put all your workgroups on the Internet. Easily and securely. To get the study that shows why Solaris is so highly thought of, call us at 1-800-SUNSOFT, prompt #1. For more information see us at <http://www.sun.com/solaris/> The solution is well within reach.

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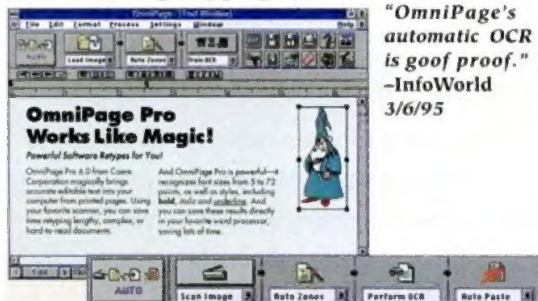
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COVER STORY

Operating Systems

What's Hard About Windows 95 & How to Make It Easy



BY LARRY SELTZER

Not every road in Windows 95 is as straight or as smooth as you'd wish. Some of its most powerful features are well hidden or downright tough to negotiate. From installation, bootup, and shell navigation through networking, mobile computing, and running DOS apps, we offer a guided tour to the less traveled side of Windows 95. We'll help you smooth out your ride and get where you're trying to go102

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ENDING THE PAPER CHASE



BY BEN GOTTESMAN

It's tough when you've got piles of paper and megabytes of electronic files you need to organize. To help you keep your head above water (or the mess off your desk), we've looked at the current generation of personal document/image management software packages and personal scanners. Both the software and the hardware components offer affordable, easy-to-use solutions for managing your documents and images129

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SERVING UP APPS



BY DAVID S. LINTHICUM

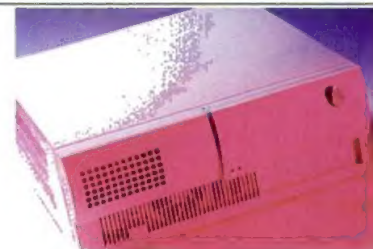
Whether you're scaling down from mainframes to PC servers or adding a groupware application like Lotus Notes to your LAN, you'll need a powerful application server and the right network operating system to run it. Today's server OSs take advantage of new Intel-based servers that offer multiprocessing capabilities and faster performance. We test four x86-based NOSs; we also look at SunSoft's Solaris x86 and report on where NetWare is headed as an application server NOS205

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BY JIM SEYMOUR

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PC Magazine At Home

HOOKING UP WITH HOME MODEMS

BY BRUCE BROWN

You've heard about Cyberspace, but you've never visited? Well, get a modem for your home PC and start netsurfing. The latest wave of 28.8-Kbps external modems are fast and inexpensive enough to make on-line accessible to every home. We tested ten of the best-sellers in order to give you the most up-to-date advice, whether you're upgrading from a slower modem or investing in communications for the first time371



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And you discovered that you can add French subtitles to a product

And you discovered



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And you discovered how convenient it can be to fax a purchase order

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Alas, Delrina developers still haven't figured out how to fax into someone's brain after 11 P.M. (when rates are lower) without waking him or her up.

WM Fortunately, their latest release – new Delrina WinFax™ PRO 7.0 – is as easy and powerful as one would expect from the best-selling, most award-winning fax software in the world. It fully exploits new Windows® 95's 32-bit

multi-tasking, multi-threading talents for true background faxing, greater speed and more. But it doesn't stop there. WM With the new TalkWorks™ telephony option and your voice modem, WinFax PRO 7.0 turns your computer into an integrated in-box for faxes, e-mail and voice mail. It even takes phone messages, distinguishes



between fax and voice calls, has fax on demand and identifies callers before you pick up. WM And there's more. Built-in compression cuts fax transmission time (and phone bills) by up to one-third. It now supports gray-scale faxing, integrates with Microsoft® Exchange, and includes OCR, 101 ready-to-use fax cover sheets and tools to design your own.

WM You can even get WinFax PRO as part of new Delrina CommSuite™ 95, the complete, affordable, integrated communications software solution for Windows 95. WM All of which should suffice until the new alpha wave faxing program is ready. (Hmm. Perhaps if we *partition* your brain so that one half can receive faxes while the other remains undisturbed...) **DELRINA**

CIRCLE 213 ON READER SERVICE CARD



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Letters

AN INDUSTRY'S WAKE-UP CALL

Congratulations on taking a stand with your "Open Letter to CD-ROM Developers" (Quick Spins, "Top 100 CD-ROMs," June 27, 1995). I hope the developer community takes your concerns seriously. I've been enjoying CD-ROMs for a couple of years, but nowadays I dread installing any new CD in anticipation and fear of all the system changes that will take place over which I'll have no control, and of the many hours debugging those changes chances are I'd be faced with.

GUS TRUJILLO, via PC MagNet

The series of Quick Spins in your top CD-ROMs article offers some interesting tips and suggestions. The last one, "Open Letter to CD-ROM Developers," prompts this suggestion to *PC Magazine*: When you review CD-ROM offerings, point out which publishers are not following these guidelines. That might prompt us consumers to not buy their products, which in turn just might teach vendors to follow these practices. It's a bit late to find out that a CD-ROM is going to do some weird things to my system after I've paid my money and installed the disk.

CARL WHITE, via PC MagNet

One point that was not considered in your Top 100 CD-ROMs round-up was how reference volumes—in particular CD-ROM encyclopedias—stack up in terms of the comprehensiveness and depth of content as compared with a traditional print encyclopedia. Just because something is on CD-ROM doesn't mean it's better.

R.L. LABARGE,
Pittsburgh, Pennsylvania

THE STATE OF THE CD-ROM

I commend Bill Howard for an informative column on today's CD-ROMs ("What's the Matter with Today's CDs?," June 27, 1995). Indeed, too much of the software released on CD-ROM is produced sloppily.

DANIEL SHAEFFER, via PC MagNet

EVERYTHING HAS ITS TIME AND PLACE

Jim Seymour's comments about when and where it's appropriate to use new technology hit the nail on the head ("Moving Bits, Not Atoms," June 27, 1995). As a high school technology teacher, I face this syndrome every day. Because I'm technologically proficient, other teachers and staff are sometimes amazed that I'm not using a computer for everything I do. I've often found myself giving an explanation similar to that which Seymour provides. I'm going to quote Seymour at our next campus technology committee meeting.

BRIAN R. SMITH, via the Internet



*It's too late if, after you've paid,
you learn a CD-ROM will do
weird things to your system.*

THE ON-GOING, ON-LINE PERSPECTIVE

Although your First Looks review of CompuServe (June 27, 1995) states that "you have to navigate the service while on-line, which costs time and money," WinCIM and CISNav are just two of the front ends that let you compose e-mail and navigate the service to varying degrees off-line. Also, CompuServe's lack of "true integration" of its Web browser at the time of your review was not a weakness: CompuServe was the first—and at that time the only—service to allow users to freely choose their Internet access tools.

THOMAS G. SEMPLE, via PC MagNet

One thing you failed to mention in your report on on-line services was the incredibly annoying and continual updating of artwork. Every time I visit a forum, the artwork has to be updated. If you're constantly exploring new places, it gets to be a real drag, even at 14.4 Kbps. It would be far more preferable if the services could find a way to update the artwork in the background.

DOUG NOBLE, via the Internet

Contrary to America Online's statement that there's an on-line option that guarantees immediate account cancellation (Letters, June 13, 1995), going to keyword CANCEL tells you only that you have to call via telephone or send a letter via U.S. mail to cancel your account.

CRAIG AUSTIN, via the Internet

The comments made in your story on this past spring's Web browser releases from America Online, CompuServe, and Prodigy were right on target with my experiences. However, the

author omitted any discussion or anecdotal observations related to service reliability. I've reported my problems connecting with AOL, only to be assured by AOL that it's my equipment or phone line that's at fault (which is plausible, except for the fact that within minutes of the AOL problem I can get perfectly fine performance from CompuServe and a local Internet service provider under the same conditions). I was also advised by AOL that I can get a better response by waiting until after 1:00 a.m. to log on—certainly not my idea of a viable solution for someone who works during the day!

FRED FACHET, via PC MagNet

GRIPES FOR NOW, AND FOREVER?

Most of John C. Dvorak's observations in his "Gripe List '95" column (June 27, 1995) are right on target, especially in requesting that a standard finally be adopted for backup tapes.

DAVE EDITOR, via the Internet

Stylish PCs are so pointless that they're not even worth mentioning. Does it really matter what color your PC is? And do big companies really want to waste time deciding what color their next 1,000 computers should be?

DANNY ABRAMSON, via PC MagNet

I purchased my old Honeywell mouse three years ago and it works as well today as the day I first bought it. Strangely enough, this mouse didn't even need a mouse pad and even works upside down, thanks to an unusual design that provides a substitute for the troublesome mouse ball. Too frequently, companies are not praised when they do something right, and even though Honeywell has long since sold the division that manufactured this mouse, this is one product that truly was done right.

SCOT W. PERRY, via the Internet

People find much too much to complain about. Stop looking for the perfect tool, leave the coffee station, go back to your desk and get some work done. Also, if you want great resolution and unlimited colors, try looking out your window. It's a lot cheaper than buying new hardware.

JON STIVERS, via the Internet

THOSE BEHIND THE CURTAIN

Thank you for the informative and thorough review of high-end graphics cards ("Ultrafast Graphics: The Professional's Choice," June 27, 1995). In the article you credit the "Number Nine-engineered PowerPac drivers" as the source of #9GXE64 Pro's impressive AutoCAD performance. In fact, the PowerPac drivers were written by Vibrant Graphics, which also provide the 3D Studio R3/4 and AutoCAD R13 DOS drivers to Autodesk.



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CIRCLE 088 ON READER SERVICE CARD

Letters

The advanced version of the PowerPac, Soft Engine, is available directly from Vibrant Graphics (512-918-2270). It accelerates all versions of AutoCAD for DOS and Windows and now supports over 350 graphics cards.

LINDEN SIMS,
*Director of Product Development,
Vibrant Graphics Inc.
Austin, Texas*

IS BIG BROTHER REALLY WATCHING?

It was with great amusement that I read Robin Raskin's Pipeline column "Microsoft, Keep Out!" (June 13, 1995). I, too, was uneasy when I read that Windows 95 wanted to scan my system and submit my configuration to Microsoft. I realized, however, that when installing Windows 95, we're given the option of submitting this information. And that's a good thing, too. Those actions would smack of Big Brother, and people are just not willing to put up with that today.

JAMES CARSWELL,
Vancouver, British Columbia, Canada

I agree with Raskin's conclusions. On-line registration in general makes me uncomfortable, and it brings a few questions to mind. Could a program installation search your hard disk and compile a user profile; then, upon registration, download that information without your knowledge? And could the profile include data from a program? Paranoid? Well, maybe... just a little.

STEVEN BERGESCH, *via the Internet*

HERE WE GO AGAIN... AND AGAIN...

After reading the assortment of letters in your issue of June 27, 1995, indicating problems with OS/2 installations, it dawned on me that no one's remembering the bad old days of installing Windows 3.0 or 3.1 on existing systems. We've all forgotten how much fun that was! Any change to the environment for the potential 60 to 70 million machines out there is going to have problems. Admittedly, though, OS/2's installation and driver availability does need to be improved.

KEN LIPPER, *via the Internet*

As a supporter and user of both Windows and OS/2, I've enjoyed following the banter back and forth between the zealots of both systems. *PC Magazine* should never forget what it does so well: making the computing public aware of the best PC software available, regardless of what platform it runs on.

M. CRUISE, *Ketchikan, Arkansas*

ISDN REALITIES

Are the phone companies really going to try to justify doubling ISDN rates based on a \$3 increase in FCC fees (Trends, "ISDN Markup

The correct contact information for Wearnes Peripherals ("The Driver Manual," September 12, 1995), is: phone, 408-432-1888; fax, 408-432-1884; BBS, 408-432-1884.

The correct telephone number for Qualcomm's Eudora Pro (New & Improved, September 12, 1995) is 619-658-1291.

The phone number for Horizons Technology's Open!Info Manager (First Looks, "Open!Info Manager Makes Multimedia Happen," September 12, 1995) is 619-292-8331.

There were four inaccuracies in our evaluation of SuperOffice Corp.'s SuperOffice 3.0 ("Sharing the Wealth," August 1995). SuperOffice can show all current fields during the import process; it has drag-and-drop capability within modules (but not between modules); it offers right-click context-sensitive menus for certain portions of its screens; and it supports ODBC access to data.

Battle," June 13, 1995)? If this is the case, I think the blame is being put on the wrong side. It looks as though the phone companies see this subscriber line charges increase as a golden opportunity to raise rates and use the FCC as the scapegoat.

ADAM MCKENNA, *via the Internet*

Before the phone companies can raise their ISDN rates, they have to offer the service. I currently reside in Salt Lake City. As recently as this past summer, I called to inquire about U.S. West's ISDN availability and got the response, "Sir, what is ISDN?" We need to press the phone companies to do what the public wants and not what they think we want.

PAUL MURDOCK, *via PC MagNet*

IN THE DRIVER'S SEAT

Thank you for your extensive coverage of hardware compatibility with Windows 95 ("The Driver Manual," September 12, 1995). While we appreciate this coverage, we'd like to clarify the status of the availability of Diamond Multimedia's Windows 95 drivers.

HOW TO CONTACT US

We welcome your comments and suggestions. Please send Letters to the Editor via

THE INTERNET 157.9301@mcimail.com

COMPUSERVE 72241,104, or to individual editors as listed on ZiffNet (type GO PCMSTAFF)

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We regret that we cannot answer letters individually. To send submissions for PC Solutions, please see the sidebar "How to Contact Us" on the second page of that column.



Most of Diamond's graphics accelerator products are currently supported "in the box" with Windows 95. Additionally, Diamond will release new drivers this fall that further enhance the performance of Windows 95. Our customers can obtain the new Windows 95 drivers on-line from our America Online, BBS, CompuServe, and Internet sites.

KIMBERLY ANN STOWE, *Marketing Manager, Diamond Multimedia, San Jose, California*

Your "Driver Manual" incorrectly stated that several Panasonic dot matrix and laser printers were not Windows 95-compatible. The Panasonic KX-P6100 laser printer has been shipping with both Windows 3.1 and Windows 95 drivers; all units shipped prior to September 1995 included a Windows 3.1 driver and a coupon for registered users to obtain a Windows 95 driver at no charge. In addition, users can select the Panasonic KX-P2123 driver (PANSON24.DRV) for both the KX-P2130 and the KX-P2135 dot matrix units. Users can also select the Epson LQ-1170 driver (ESCP2MS.DRV) for the KX-P3624 dot matrix printer and the KX-P1695 driver (PANSON9.DRV) for the KX-P3696 dot matrix printer. Users can also obtain drivers via Panasonic's bulletin board at 201-863-7847.

GARY BAILER,
*National Sales & Marketing manager,
Panasonic Communications & Systems Co.
Secaucus, New Jersey*

Your "Driver Manual" indicates that only two of NEC's ten CD-ROM products are Windows 95-compatible. To clarify, the entire line of NEC CD-ROM readers listed in your report is compatible with Windows 95. All new NEC CD-ROM readers, including the MultiSpin 6Xe and 6Xi, are Plug and Play-compatible. Also, the NEC CD-ROM readers that we OEM'd to Media Vision are listed as Windows 95-compatible. However, the readers are not Plug and Play-compatible.

PAT FOBES, *Director of Marketing, Advanced Media Group, NEC Electronics Corp. Buxborough, Massachusetts*

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	850C			850C			850C	
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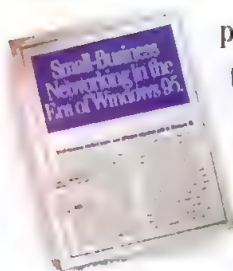


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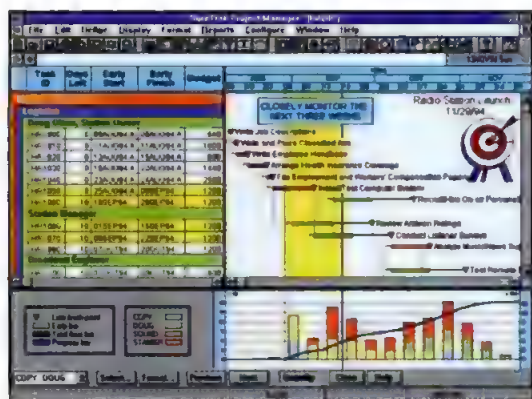
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Trends

TRENDS & TECHNOLOGY SHAPING THE PERSONAL COMPUTER MARKET

Net Security Under Scrutiny

8 days, 120 workstations, and 2 super computers later. . . .

How do you transform an inherently insecure Internet into a forum for conducting private financial transactions? By implementing Secure Sockets Layer (SSL), which uses cryptographic techniques pioneered by RSA Data Securities, Netscape Communications has an answer.

But that approach has come under scrutiny since Damien Doligez, a researcher at the French National Institute for Research in Computer Science and Control in Le Chesnay, France, cracked a single encrypted session. It took him eight days using 120 workstations and two supercomputers.

To understand just how safe Netscape security really is, it's important to understand how RSA cryptography works. RSA is a variable-length public-key cryptographic algorithm that encrypts data using a mathematical formula. The length of the key can vary from 40 bits to 1,024 bits. As the length increases, the chances for breaking a session decrease

.com/comprod/mirror are designed to use keys of only 40 bits to comply with U.S. export laws. But all Netscape secure servers support key lengths of up to 128 bits. Any Netscape browser sold in the U.S. supports 128-bit keys, which are virtually impossible to crack.

So why does the U.S. impose such strict export laws on encryption? The National Security Agency wants to ensure that the key length of encrypted data is short enough to crack easily. Today it's a federal crime, equivalent to selling illegal arms to foreign governments, to export cryptographic software larger than 40 bits. The Arms Export Control Act <ftp://ftp.cygnus.com/pub/export/aeca.in.full> and the International Traffic in Arms Regulation (ITAR) <ftp://ftp.cygnus.com/pub/export/itar.in.full> detail the export rules for encryption. Says Jim Bidzos, CEO of RSA, "It looks like the government wants to outlaw cryptography."

Meanwhile, not only is the full SSL specification (which includes RSA's cryptographic method) available on the Internet at <ftp://ftp.psy.uq.oz.au/pub/Crypto/SSL/>, but there are even instructions at <http://www.brute.cl.cam.ac.uk/ftp/pub/brute/protocol.txt> that will guide you through the whole process of breaking RSA encryption. And the source code that Damien Doligez used to decrypt the now-famous encrypted session is available at <http://pauillac.inria.fr/~doligez/ssl>. Security experts who frequent newsgroups such as *comp.security.misc* and *sci.crypt* agree that it was only a matter of time before someone broke 40-bit encryption.

Recently the government has realized the limitations of its export laws, and it is working toward legislation that would allow the export of keys as large as 80 bits. But the new laws also require companies like RSA to escrow the keys, which the government could obtain with a warrant.

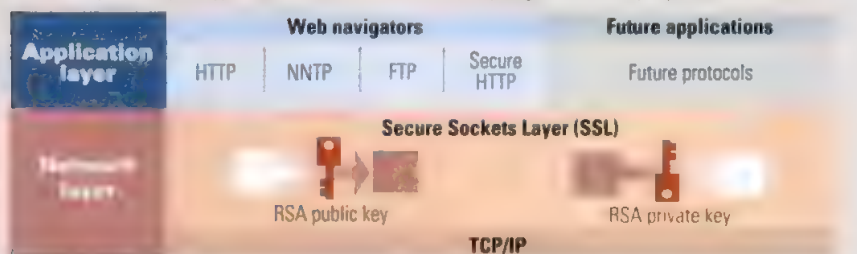
Is the RSA encryption scheme vulnerable? If implemented correctly, with at least a 48-bit key length, the algorithm is virtually impossible to crack given today's computer resources. And the chances of someone not only intercepting the flow of traffic on the Internet but also having the resources to decrypt a session are extremely low. Even with a 40-bit key, the cost of breaking it, in most cases, is much greater than the value of the information that can be gained.

—O. Ryan Tabibian

Built-In Lock and Key

Netscape's SSL protocol provides security between the network (TCP/IP) and application layers. SSL uses RSA's public-key encryption scheme, so

messages encrypted with an RSA public key are decrypted only with the corresponding private key. The key length is limited by export restrictions.



Does this mean that the Internet is unfit for commerce? Not necessarily, says Aaron Wallace, cofounder of Internet Factory. He recently implemented the SSL protocol on the Internet Factory Commerce Builder and says that the problem is not with the RSA cryptography—which is almost impenetrable if implemented correctly—but rather with the level of security in products the government allows companies to export.

exponentially. For instance, if Doligez were to break a key 41 bits long, rather than the 40 bits he actually broke, it would take him twice as long, or 16 days, given the same computing power. If you increased the number of bits to 48, it would take 256 times as long to break the same code, or roughly five years of continuous computing.

Currently, all versions of Netscape browsers available at <http://home.netscape>

Pipeline By Jake Kirchner

The Low Spark of High-Tech Competition

What in the world has happened to the PC software business? Somehow over the last few years most of the energy of the market has just kind of sputtered away, leaving us with the most noncompetitive group of application vendors in the last decade.

Case in point: Three years ago we pitted a dozen word processors against each other for the coveted *PC Magazine* Editors' Choice. Today we struggle to find half that number to evaluate. The situation's no better in spreadsheets, databases, presentation graphics, or utilities.



Three years ago, WordPerfect's Pete Peterson strutted across a Comdex stage in Las Vegas as he ripped into Microsoft's Bill Gates. At the same show, Borland's Philippe Kahn was spitting angry at the competitive tactics of Microsoft and WordPerfect. Lotus's Jim Manzi was the wild man of Massachusetts in those days, and

Fifth Generation's lectern-thumping Barry Bellue would publicly spew out epithets about his competitors.

Sure, that was great fun. But more importantly, these blood-rival contestants chased each other through the market from one feature development to the next. In the process, they pushed the quality of software upwards at an amazing rate and drove the prices downward at an equally dizzying pace. Every revision pushed the competition to newer heights. Every user benefited.

Today? Well, you know WordPerfect has been swallowed up by Novell. Borland is content to struggle through the backwater markets of development languages, having dealt away its

strongest asset, Quattro Pro. Lotus is now part of IBM, which seems smitten with Notes but uninterested in the other applications it's gaining from Lotus. And Fifth Generation, along with just about every other utility vendor, has been gobbled up by Symantec.

Many of these folks are still in the business in some form. Lotus and Novell/WordPerfect still have top-quality word processors and spreadsheets. And Borland is doing a respectable level of business, while Philippe Kahn, now chairman of Starfish Software, continues to push the price/performance envelope with impressive new versions of Dashboard and Sidekick.

But they're all fighting it out for runner-up to the monstrously successful Microsoft Office suite of applications, the white-bread market leaders—adequate applications that are filling without being particularly nutritious. During our recent visit to Lotus headquarters, the WordPro people praised their product but acknowledged they're playing for "a tie with Microsoft." A tie?! If that's not bad enough, the Novell/WordPerfect folks now are making loud, boastful claims on second place.

There's still some competition in the computer business today. Look at how the PC vendors scrape for every sliver of market share. And witness the blood all over the on-line services and networking businesses. If you want a good fight, you still don't have to look far; just don't look to the applications vendors for a rousing set-to anymore.

On the positive side, there's a whole new game afoot. With the launch of Windows 95, millions of PC users will be looking over the new 32-bit apps. Many of the now-second-tier vendors are hoping this gives their competitive situation a needed boost.

I'm hoping they're right. If Windows 95 does nothing more than reinvigorate the lackadaisical applications market, Microsoft will have done a great service to the world's 100 million PC users. And it will have made my life a lot more interesting.

Jake Kirchner is the editor of PC Magazine.

Joysticks Get a GrIP

THE PC'S GAME PORT HASN'T advanced since Pong was in its heyday. Back then it didn't really matter that a joystick exacted a performance penalty of up to 15 percent, or that you were limited to two joysticks with just two buttons each per computer—hardly enough for serious gamers today.

A new technology from Advanced Gravis, maker of joysticks and gamepads, is designed to bring the game-port standard up to fighting weight. The Gravis Interface Protocol (GrIP) is a high-speed digital communications interface—it is upward-compatible with the forthcoming Universal Serial Bus—that supports up to four players on a single PC. Since it's bidirectional, it can send information from the joystick to the game and from the game to the joystick. The new interface supports multiple axes for 3-D

play as well as proportional buttons, so you can not only direct a player to kick a soccer ball but also indicate how hard to kick it. According to Advanced Gravis, the protocol is able to transmit joystick position and status to software ten times as fast as existing standards.

GrIP's ability to communicate bidirectionally could open the game-controller market to innovative new devices such as tactile-feedback joysticks and controllers with private video screens that display special weapons or strategic information you don't want your opponents to see. To connect a GrIP joystick or other type of game controller to a game port, you'll need the Gravis GrIP Multi-Port "breakout box," which supports four GrIP devices. The first controller that works with the breakout box is the eight-button Gravis GrIP Game Pad (\$19.95). The company expects to consider proposals from hardware manufacturers that want to imple-

ment the technology.

Major game developers, including Electronic Arts and Virgin Interactive, have been working with the technology since



A "breakout box" from Advanced Gravis supports two standard and four GrIP game controllers.

May, and the protocol is supported by Windows 95's Direct Input specification—a standard by which all Windows 95 applications communicate with input devices. Most new PC games should support Direct Input by mid-1996.—Carol Levin

Microsoft Maps Internet Inroads

"THE INTERNET IS THE MOST important platform since the IBM PC was introduced in 1981," says Anthony Bay, general manager of systems for the Microsoft Network. At the recent Windows 95 rollout, Microsoft officials gushed as much about the Internet as they did about their new operating system. Microsoft executive vice president Steve Ballmer says that the Internet has contributed to the single most important drop in communications costs in recent history—"a worrisome development for the phone companies." Bay went on to paraphrase Microsoft chairman Bill Gates as saying that "the Internet is more important to Microsoft than the graphical user interface." It should come as no surprise that Microsoft has set some ambitious Internet-focused goals, which became clearer at the Windows 95 rollout.

Much has been made of Microsoft's goal to make applications "Internet-aware"—but the company's Internet strategy clearly extends far beyond that. Through its investment in UUNet, Microsoft wants to become a leading service provider in the U.S. for

Internet access. That goal could get a boost from the Microsoft Network's tight integration with Internet access tools.

Netcom is the country's leading access provider, but Ballmer says that if bandwidth



Microsoft's Blackbird produces content for the Microsoft Network and the Internet.

issues permit, Microsoft could take the lead in 1996. Microsoft is also targeting Windows NT as the premier Internet server platform, incorporating components from Microsoft as well as from third parties.

Internet authoring tools are also emerg-

ing as a key area of focus for Microsoft. While Blackbird, Microsoft's forthcoming on-line authoring tool, has been largely pigeonholed as a system for developing Microsoft Network content, the company is positioning it as the best overall Internet authoring tool. Microsoft is also said to be working on a Visual Basic-based scripting language for creating Web content.

In some ways—such as building easy Internet access right into its apps—Microsoft appears focused on leveraging the Internet as it stands now. But in other ways—such as seeking the dominant spot in providing Internet access and positioning Blackbird as an extension of existing authoring standards—the company may be more focused on shifting Internet conventions toward models of its own making. "HTML and FTP are the DOS of today, and the seed corn for the next generation of software," says Ballmer.

Extending existing standards, according to Reuters' Mark Goldstein, could prove divisive. "The best rule on-line is to leverage the Internet and its standards, not compete with them," he says.—*Sebastian Rupley*

Gordon Moore Crunches Chip Numbers

GROWTH IN SEMICONDUCTOR power has provided much of the fuel for the PC industry's rise. From Microsoft's operating systems to PC manufacturers' new offerings, new-generation semiconductors have consistently been "the straw that stirs the drink." But some pundits see limitations on future semiconductor advancements, for reasons both technical and not.

Speaking with *PC Magazine* editors at the launch of Windows 95, Microsoft chairman Bill Gates expressed concern that limitations on the number of MIPS per transistor could soon slow the feverish pace of growth in PC processor power. At Palo Alto's recent Hot Chips conference, Intel chairman Gordon Moore also sounded some cautionary notes on future growth in the semiconductor industry—although Moore blamed possible limitations on the costs required to manufacture semiconductors, not on technical roadblocks.

According to Moore, "Design cost is doubling with every new generation of microprocessors, or about once every three and a half years, while revenue growth is not keeping up." He cited the cost of a late-1990s

microprocessor factory at \$1.4 billion, and added that Intel has plans for several \$2.5 billion factories to facilitate 0.25-micron production. Moore cited rising testing-time requirements as a major cost. (The importance of testing was driven home by the uproar over the Pentium chip's division flaw.)

Although there has long been disparity between growth in design costs and growth in semiconductor industry revenues, economies of scale that have come into play as the industry has boomed have amplified the impact of that trend. Moore claimed that capital investments for the semiconductor industry are rising by about \$50 billion a year, while sales revenues are growing by under \$20 billion a year. That level of disparity can't go on for long in any business. Meanwhile, competition in the semiconductor industry—which has driven revenue growth down in recent years—is on the rise.

Moore's keynote was quite upbeat with regard to future advancements in semiconductor technology, though gloomier on business fundamentals, which, he said, "loom as real practical limits on the industry."

—*Sebastian Rupley*

Top Retail Software

Current ranking	Last issue	Product	Company
1	3	MS Windows 95 Upgrade	Microsoft Corp.
2	1	MS Plus! for Windows 95	Microsoft Corp.
3	—	MS Office Professional with Bookshelf for Windows 95 Upgrade	Microsoft Corp.
4	8	MS Word 7.0 for Windows 95 Upgrade	Microsoft Corp.
5	4	Norton AntiVirus for Windows 95 Upgrade	Symantec Corp.
6	9	MS Excel 7.0 for Windows 95 Upgrade	Microsoft Corp.
7	—	MS Office Standard for Windows 95 Upgrade	Microsoft Corp.
8	—	WIN 95 Advisor 1.0	TouchStone Software
9	—	MS Works with Bookshelf for Windows 95	Microsoft Corp.
10	7	MS Windows 95	Microsoft Corp.

This list ranks PC business programs according to the total number of copies they shipped to over 12,000 stores and resellers in the week ending August 31, 1995. The list cannot be interpreted as a picture of the entire software market. Adapted from a compilation by Ingram Micro.

Psychoacoustic Effects in 3-D

WHETHER OR NOT YOU WANT AN immersive experience with your PC, you may be getting one later this year. No longer a bleeding-edge technology, 3-D sound is becoming a standard feature in many PCs, and software developers are building advanced sound features into their games.

There are several ways to achieve the effect of 3-D sound on your PC. Technologies such as QSound, Spatializer, and SRS attempt to reproduce the original listening experience by expanding recorded sound. A new technique from Creative Labs manipulates the sound before it's recorded. And speaker manufacturer Altec Lansing has developed the equivalent of a home theater on the PC with its three-speaker Surround Sound system.

Later this fall, SRS (Sound Retrieval System), from SRS Labs will be built into the motherboards of new multimedia PCs shipping from NEC, Packard Bell, and several other major PC manufacturers. SRS is based on the simple principle that stereo recording fundamentally distorts sound—as the audio cues that give us a sense of spatial realism are lost.

Designed to expand the stereo field, SRS extracts information from the stereo signal and attempts to restore the original spatial relationships based on the shape and physiology of the human ear. "It's like listening to a stereo recording through mono speakers and then figuring out that richer sound is hiding there," says Alan Kraemer, director of engineering at SRS.

Sound engineers at SRS take into account what are called "head-related transfer functions"—spectral shifts caused by the shape of the outer ear, the absorption of sound by the body, and reflections off shoulders which help in locating sounds—to change the characteristics of ambient sounds. By adding and subtracting left and right signals, SRS is able to make sound that originates from speakers in front of you seem as if it's coming from behind you.

Spatializer, another 3-D stereo technique, combines both stereo enhancement and sound localization. Compaq recently signed on Spatializer for its new Compaq Presarios, headed for the home market this fall.

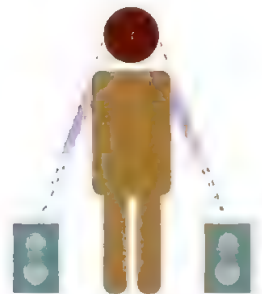
While stereo enhancement techniques are postprocess ways to restore original sound, Creative Labs and E-mu Systems have developed a preprocess technology

that game developers are using to create sounds that don't exist in nature. Since there's currently no way to make a stereo recording of a spaceship doing a flyby of an exploding asteroid, Creative Labs is synthe-



Sound Immersion

SRS creates a 3-D sound field extending beyond the speakers to the sides and rear of the listener (left). Stereo creates a flat sound field between the speakers and practically demands a centered listening position (right).



Source: SRS Labs.

sizing 3-D space and giving game developers control over independent voices. Games must be written specifically to take advantage of the specification, and a system running them must include a Sound Blaster

moving around the position of the listener—all in real time and controlled by the joystick. These are tricks that go beyond the capabilities of a stereo-enhancement system.—Carol Levin

The Electronic Charge Slip

SECURITY FOR INTERNET CONNECTIONS is built into browser and server software, but an extra security blanket designed for protecting financial transactions is another, potentially lucrative ballgame. That's why Cybercash, MasterCard, Microsoft, Netscape, Visa, and other companies are developing complete payment systems for delivering credit card information inside a sealed digital envelope.

Microsoft's Secure Transaction Technology (STT), which is up and running at the company's campus in Redmond, Washington, is based on the charge-slip metaphor. Tom Johnston, product manager in the consumer systems division, explains that it's designed to maintain existing business relationships among customers, merchants, and banks. Customers digitally sign encrypted credit card information, which merchants pass along to banks, where it is decrypted and processed. An authorization is then returned to the merchant. Microsoft has entered into a licensing deal with Visa International for STT.

While the government does not allow the export of software that uses powerful encryption methods on large amounts of data, developers are permitted to export

products that use the same techniques on well-defined data, such as account numbers and charge amounts. Since the information involved in a purchase is well defined and limited, developers are receiving export licenses for their transaction software. The National Security Administration recently allowed an export license for CyberCash, and Netscape has submitted a request for a license to export Secure Courier, a competing 56-bit encryption payment system supported by Intuit and MasterCard.

Meanwhile, CompuServe has developed the CompuServe Wallet, which uses a 56-bit RSA encryption system from CyberCash. The on-line service's CheckFree credit card processor decrypts the information and processes the transaction as usual.

Will goods available electronically be sold at a discount to encourage on-line commerce? Not necessarily. "For the customer to save money, the entire model would need to be changed," says Johnston. Not surprisingly, many of these electronic-transaction systems have mechanisms to allow the originating bank as well as the company providing the on-line technology, to charge a service fee for each transaction.—Carol Levin

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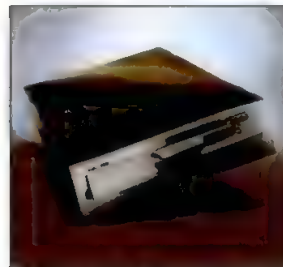
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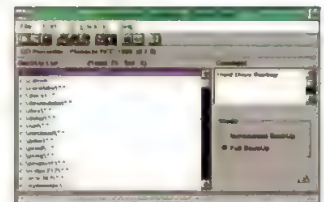


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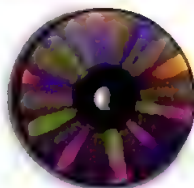


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First Looks

HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

WINDOWS 95 UTILITIES: SPECIAL REPORT

Microsoft Plus! and Third-Party Utilities Offer Windows 95 a Helping Hand

By Edward Mendelson
and Barry Simon

Microsoft Windows 95, with its vastly improved file manager and array of built-in utilities, has not only raised expectations for users but has raised the bar for utility makers. As good as Windows 95 is, there are still opportunities to extend Microsoft's new operating system, and the company's \$49.99 Plus! package of add-ons is a step in the right direction.

Plus!, which requires 8MB of RAM and 25MB of hard disk space, provides Windows 95 users with visual enhancements, improved disk compression, a scheduler, communication tools, and a 3-D pinball game. The most noticeable part of Plus! is the font anti-aliasing technology that uses gray-scale techniques to make fonts appear smoother. For many, the most interesting enhancement will be the professionally designed sets of icons, fonts, and wallpaper, as well as color and sound schemes that are based on themes such as engineering and science. Some of the themes require systems that support 64,000 colors, however.

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Plus!'s new disk-compression utility, DriveSpace 3, will appeal to those who have filled their hard disks with Windows 95. DriveSpace 3 supports virtual drives up to a capacity of 2GB, four times the 500MB limit of Microsoft's previous compression engine. In informal testing, DriveSpace 3 was nearly able to double the capacity of a 125MB hard disk to 248MB in standard mode. Using the HiPack and UltraPack modes, the hard disk's capacity jumped to 254MB and 264MB, respectively.

DriveSpace 3's special compression modes require that your sys-



PINBALL WIZARD: Plus! adds a realistic 3-D pinball game to Windows 95.

tem periodically compress the disk while your system is inactive. To accomplish this, there's a Scheduler, which will start programs at

preset times. The Scheduler can run the compression agent, Backup, Scandisk, the disk defragmenter, and anything else.

Plus!'s Internet tools include an Internet mail (SNMP/PopServer)

link for Exchange, an Internet setup wizard that automates the creation of a dial-up PPP connection, and a World-Wide Web browser. Although not as powerful as Netscape Communications Corp.'s Navigator 1.1, the Microsoft browser is more than adequate but may deactivate your present Internet connection. The Plus!

Internet tools are available at Microsoft's World-Wide Web site (www.microsoft.com/windows).

Continues on page 38

NOTEBOOK PCS

Portables That Try to Be All Things to All People

While we're waiting to see what kind of performance boost Intel's next-generation CPU, the P6, has in store, the Pentium processor still has plenty of steam. And squeezing more power out of Pentiums isn't all notebook designers have been up to. They've been filling out their systems by paying additional attention to design details, adding creature comforts, and delivering extra multimedia features.

The four notebooks we review here—three stuffed with Pentium CPUs and one carrying a 75-MHz DX4 processor—all have something a little different to offer mobile professionals. At the high end of the portable performance spectrum are AST Research's Ascentia 950N and Gateway 2000's Solo S90. Both units have Super VGA active-matrix color displays and use 90-MHz Pentium CPUs. Toshiba's Satellite Pro 400 CDT contains the portable industry's first built-in quad-speed CD-

ROM drive and offers excellent performance. At the other extreme, Texas Instruments' Extensa Model 450 entices with its hybrid subnotebook-notebook design, its built-in floppy disk drive, and its agreeable price.

Whether you're looking for an all-out multimedia machine or one that will help you stay connected while you're away from the office, you're likely to find a notebook that suits your needs and your budget.

AST ASCENTIA 950N

The \$5,548 Ascentia 950N comes packed with a full complement of features, including a 90-MHz Pentium processor, a Super VGA active-matrix color display, 16-bit audio capability, and a built-in speaker. All the Ascentia needs is a CD-ROM option.

The first thing you'll notice about the 1.8- by 11.5- by 8.5-inch (HWD) Ascentia—which has a 7-pound travel weight—is its new

10.4-inch Super VGA active-matrix color display. The Hitachi screen is capable of displaying 64,000 colors at 800-by-600 reso-



WHAT A VIEW: The Ascentia 950N's Super VGA color screen gives you a wider perspective on your work.

lution—good news for users who work with multimedia presentations, large spreadsheets, or complex graphics. The Ascentia's dis-

Continues on page 44

First Looks

While at Microsoft's Web site, check out PowerToys, a set of downloadable utilities. PowerToys includes an audio-CD player, a program to change the color depth of your display without rebooting, and a viewer for Microsoft's new .CAB format.

Plus!, PowerToys, and the utilities from independent software vendors that we review on the following pages add a great deal of depth to an already rich operating system. From Norton Navigator's elegant enhancement of Windows 95's Explorer to Microangelo's Windows 95's icon editor, the current crop of utilities offers something for every Windows 95 user.

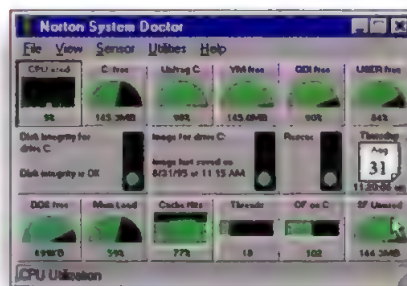
NORTON UTILITIES: DATA INSURANCE FOR WINDOWS 95

Symantec Corp.'s \$119 Norton Utilities for Windows 95 is the one utility package that you absolutely need to buy if you think

your data is priceless.

Norton Utilities includes an easy-to-use utility for recovering files deleted by applications that don't send deleted files to the Windows 95 Recycle Bin. The Norton Disk Doctor corrects problems in Windows 95 file structures and compressed disks more effectively than Windows 95's Scandisk.

The System Doctor displays system performance and alerts you when the data you need for disaster recovery is out of date. The disaster-recovery disks that Norton Utilities creates include a copy of the Windows Registry as well as enhanced versions of Norton's traditional DOS-based recovery tools such as its disk editor, unformat, diagnostics, and character-mode Disk Doctor. The DOS-based tools run under earlier versions of DOS, so you can repair damaged long filenames without loading Windows.



WINDOWS 95 INTERNIST: Norton Utilities' System Doctor reveals much about the internal workings of Windows 95.

The most significant new feature is Norton Protection, which preserves all files deleted by any application while Windows is running. Although you access Norton's erased-file-recovery dialog box from the context menu of the Recycle Bin, Norton Protection doesn't use the Recycle Bin's hidden directory to store files. You can purge deleted files periodically rather than using the

Recycle Bin's method, which is based on accumulated file size.

Norton Protection excludes .BAK and similar archive files by default, and can exclude any given file specification. But this feature can fill up acres of hard disk space, and there's no single switch to turn it on and off for the whole hard disk; you can disable Norton Protection for hard disk partitions individually, though.

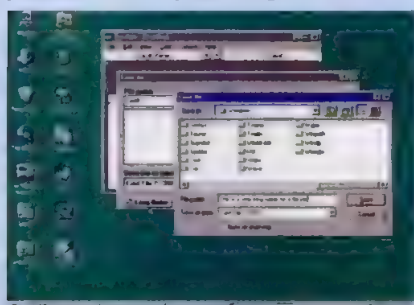
There's also a System Information utility that delves deeply into the internals of Windows 95 but doesn't provide the detailed hardware information that is available from the Control Panel. The SpeedDisk defragmenter, which can now start up unattended in the background, adds support for the Windows 95 file system and

The Long and Short of Windows 95 Utilities

By Edward Mendelson

Names: Old and New

Vertisoft Systems' \$29 Name-IT allows long Windows 95 filenames to be used in Windows 3.x applications. Depending on the program, Name-IT either replaces the application's File Open dialog box or adds a



button to the old dialog box that leads to a long-filename dialog box. Vertisoft Systems; 800-466-5875; fax, 800-466-4719.

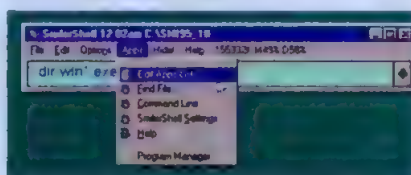
Circle 483 on reader service card

The Windows 95 Shortcut to DOS

The \$29.95 SmilerShell/95 places a powerful DOS command line on your Windows 95 desktop. The command line accepts 4DOS/NDOS aliases, and its menu bar can include a list of your favorite applications.

Drag a file to the window and the filename appears on the command line; change directories in the command line and the current Windows 95 Explorer window displays the same folder. Bardonia Data Systems; 800-242-4775; e-mail, CompuServe 72340.375.

Circle 484 on reader service card



The Catchall Utility for Windows 95

The Barry Press Utilities is a \$20 grab bag of useful but unrelated programs. The package includes a no-frills file-comparison program, a multimedia player, an icon that flips the printer orientation between landscape and portrait modes, and a Runner box that attaches to the Windows 95 Explorer pop-up menu. Barry Press Utilities; e-mail, CompuServe 72467.2353.

Circle 485 on reader service card



Interface Enhancements: Big and Small

Most of the interface enhancements provided by Planet Crafters' Plug-In for Windows work well under Windows 95 and allow nearly unlimited customization of your workspace. Some of the things you can create include title-bar messages, elaborate system sounds, silly custom cursors, reminder alarms, and an alarm that sounds when system resources drop below a certain level. During evaluation, we found that the feature that lets you assign custom icons to Program Manager groups under Windows 3.1 unfortunately doesn't work with group icons on the Windows 95 desktop. Planet Crafters; 770-998-8664; fax, 770-998-8197.

Circle 486 on reader service card

First Looks

Microsoft's latest disk-compression techniques, and can even defragment the swap file.

The installation of Norton Utilities renames most programs from earlier versions that can damage the Windows 95 file system if run from an earlier version of DOS, but fails to rename Norton's old Directory Sort program, which can play havoc with long filenames if you run it from an earlier version of DOS.

Norton Utilities is the only file- and disk-recovery package designed to work with Windows 95. You're playing with fire if you run your computer without it—**EM Norton Utilities for Windows 95**. Estimated street price: \$119, CD-ROM version, \$129. Requires: 4MB RAM, 15MB hard disk space, Microsoft Windows 95. Symantec Corp., Cupertino, CA; 800-441-7234, 503-334-6054; fax, 503-334-7474.

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NORTON NAVIGATOR: THE WINDOWS 95 ROAD MAP

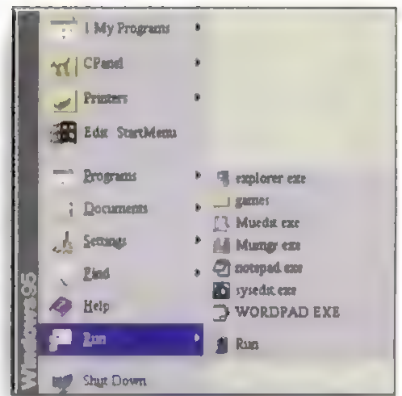
Norton Navigator for Windows 95 (\$99) is the successor to two utility blockbusters: Central Point Software's PC Tools and The Norton Desktop. Navigator provides multiple desktops and better file manipulation through its own file management and through extensions to Windows 95's Explorer. It also enhances the File Open and Save dialog boxes in both Windows 95 and Windows 3.x.

Navigator's Taskbar gives you a set of quick-launch buttons and allows you to set up multiple desktops. You can assign each desktop its own wallpaper and desktop colors but not its own individual button colors or fonts. This Taskbar can take over about a third of the space set aside for Windows 95's Taskbar (which contains your application buttons), so things can appear cramped.

Navigator enhances the Start menu with cascading lists of recently run programs, Control Panel applets, and recently used documents. While Navigator comes with its own File Manager, it also builds upon Explorer. Right-click the mouse on Copy or Move and you can browse for a destination. You can select a group of files and have Navigator compress them into a .ZIP file or encrypt or decrypt them.

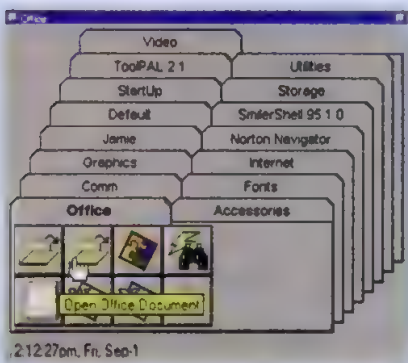
If you have a TCP/IP connection to the Internet, you can use Navigator's File Manager to perform FTP file transfers. The FTP sites appear in your directory tree as if they were on a network directory and file transfer is accomplished by dragging and dropping within File Manager.

For programs that use the



LAST IN, FIRST OUT: Norton Navigator for Windows 95 gives you quick access to your Run history.

Windows 95 common dialog boxes for File Open/File Save, Navigator's File Assist feature provides drop-down buttons with a list of files and directories recently accessed from that application as well as a configurable command list. This feature does



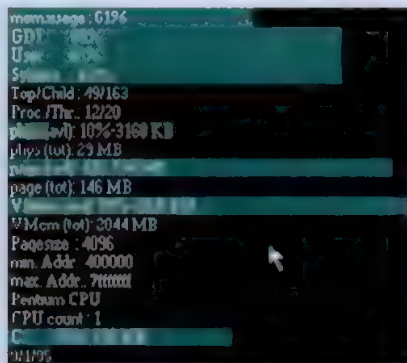
Make Your Own Button Bars

The \$49.99 Lightning Power Controls 95, from Lucid Corp., creates multipurpose button bars that can attach to individual applications or operate throughout Windows. Text or icon-based buttons can launch keystroke macros (within individual programs only, not across them), resource meters, and other information; jump among nine virtual desktops; open custom drop-down menus; paste formatted text and graphics into an application; or launch applications. The program's powerful customization options are harder to use than they need to be. Lucid Corp.; 214-994-8100; e-mail, CompuServe 72662.305.

Circle 487 on reader service card

A Look at Windows 95 Performance

TrackIt, a freeware system monitor for Windows 95, can tell you everything you

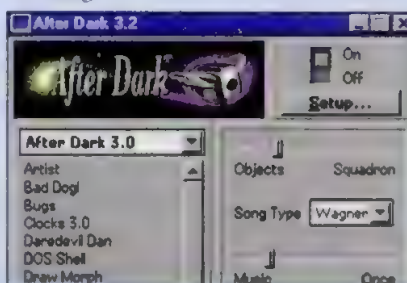


probably ever wanted to know about performance. It's not as fancy as The Norton System Doctor, but the price is right. Dietmar Bos; e-mail, CompuServe 70007.5261.

Circle 488 on reader service card

Flying Toasters Go Windows 95

Berkeley's \$30 After Dark for Windows 95 launches flying toasters and other equally amusing screen savers from the Taskbar.



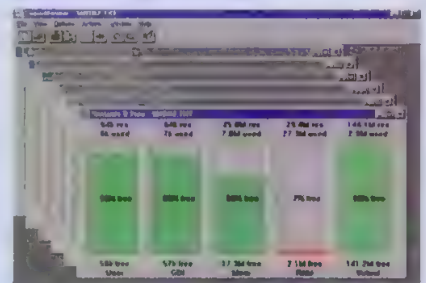
An optional icon appears in the "notification" area of the Taskbar, so you can configure any of the standard After Dark screen savers with a mouse-click. Each saver module gets its own Windows 95 Explorer icon in the After Dark directory for quick selection. Berkeley Systems; 510-540-5535.

Circle 489 on reader service card

How Much Did That App Use?

The \$39 SuperMonitor, available separately or as part of the general-purpose Tessler's Nifty Tools package, is a unique resource and memory monitor that lets you take "snapshots" of your system so that you can see exactly which resources disappear when you open a program. The interface won't win prizes, but the snapshot feature gives an exact record of how individual applications affect your system. Tessler's Nifty Tools; 510-244-5449; e-mail, CompuServe 71044.542.

Circle 490 on reader service card



First Looks

not work with the Microsoft Office 95 applications, which use special File Open/File Save dialog boxes. For programs that use the Windows 3.1 common dialog boxes, Navigator adds support for long filenames.



LAST USED: Norton Navigator for Windows 95 gives you quick access to recently run programs but can take over Windows 95's Taskbar.

As noteworthy as Navigator is, it's what's missing that's really important. There are no file viewers other than the QuickView viewers built into Windows 95, and there is no search or Clipboard-copy shortcut in the text viewer. In addition, the ASCII file-comparison program is limited to small files and can't be used to compare exported versions of your system's Registry file. There is neither a batch language nor an icon editor.

While what's missing from Navigator may disappoint many longtime users of The Norton Desktop, what's there will delight users looking to enhance Windows 95's file and program management.—BS

Norton Navigator for Windows 95. List price: \$99. Requires: 4MB RAM, 6MB hard disk space, Microsoft Windows 95. Symantec Corp., Cupertino, CA; 800-441-7234, 503-334-6054; fax, 503-334-7474.

Circle 492 on reader service card

WINBATCH 95

One of Windows 95's weakest points is its lack of automation tools, and Wilson WindowWare's \$99.95 WinBatch 95 fills that void.

WinBatch 95 is based on the same WIL language that the company has used since 1991—with some modifications that were necessary for compatibility with Windows 95. The most noticeable change is the shift from space-delimited filename lists to a tab-delimited format that can accommodate long filenames.

Included with WinBatch 95 are PopMenu and FileMenu, two interface links for those users without the inclination for writing complex macros. PopMenu places an icon on the notification bar that brings up a two-column

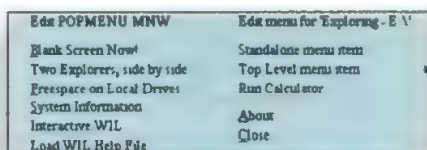
menu: one column of generic actions, and one column of actions specific to the active application. FileMenu lets you add WIL programs to the context menu of all files, or only to those files with a specific extension.

While more than adequate for basic operations, WinBatch 95 is unable to record anything more complicated than straight keyboard input. Wilson WindowWare sells the \$495 WinBatch 95+ Compiler 95, Version 6.0, for more complex automation tasks.

To get the most out of the program requires some creative work with the batch language, but WinBatch 95's abilities make it a tool many power users will relish.—BS

WinBatch 95. List price: \$99.95. Requires: 8MB RAM, 2MB hard disk space, Microsoft Windows 95. Wilson WindowWare Inc., Seattle, WA; 800-762-8383, 206-938-1740; fax, 206-935-7129.

Circle 440 on reader service card



ICON TO MENU: WinBatch 95's PopMenu brings up this menu from a Taskbar icon.

CLICKFLICK 1.5

Heavy-duty computer users will love MiraTech's \$50 ClickFlick 1.5, because it does away with the often tedious chore of moving the mouse to button bars and menus. ClickFlick works by having you click anywhere on your workspace to pop up a customizable button box and then picking the button you want.

If you currently use a two-button mouse, the initial click that brings up the button box requires the use of the Shift key, but with a three-button mouse, you can use the middle button. During our evaluation, we found that the included button boxes for Microsoft Excel, Microsoft Word, Windows 95's Explorer, and others make ClickFlick invaluable for speeding through

these applications.

ClickFlick comes with powerful tools to create and customize button boxes for any application. You can assign the following actions to a button: keystrokes, any menu action, a key to access the application's menus, and a key to access the Program menu from the Start menu. Unfortunately, the interface is crowded and hard to navigate.

Look for MiraTech to extend the usefulness of ClickFlick with an \$80 professional edition that will let you record and edit macros. This enhanced version will use an upgrade to the same Visual Basic-compatible macro language used in The Norton Desktop for Windows 3.x.

There are few utilities that are as powerful and as much fun to use as MiraTech's ClickFlick.—BS

ClickFlick 1.5. Estimated street price: \$50. Requires: 250K RAM, 5MB hard disk space, Microsoft Windows 95, Windows NT, or Windows 3.x. MiraTech, Palo Alto, CA; 800-330-9816, 415-842-7133; fax, 415-842-7144.

Circle 419 on reader service card

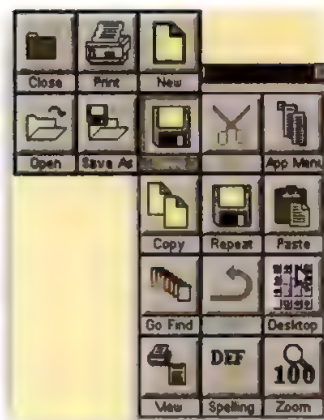
MICROANGELO

Windows 95 introduces icons that have 256 colors and are sized at either 16 by 16 or 48 by 48 pixels. Icon tools designed for Windows 3.x with 16 colors and 32 by 32 pixels can't handle this new format. Into this gap

steps Impact Software's Microangelo, which offers superb Windows 95 icon-organization and -editing tools.

Microangelo's Browser can display all the icons in a directory or all icon libraries with the number of icons inside them. From there, you can launch the Librarian and the Studio, which allow the organization and editing of icons, respectively. Impact plans to add an Animator module that lets you animate a cursor's movements.

Not only are these tools able to cope with Windows 95's new icon formats, they are also powerful and well thought out. The Librarian lets you move, copy, and assign names to icons between icon libraries. The Studio has a color eraser, as well as rectangle and el-



CLICK AND RUN: Hit the ClickFlick mouse-click inside Microsoft Word to pop up this menu.

lipse tools. In 256-color mode, the Studio has an eyedropper and a tool that locates all the uses of a particular color.

Microangelo should be the only icon-tool package you'll need for Windows 95.—BS

Microangelo, Version 1.0. List price: Browser with one module, \$24.95; with two modules, \$44.95; with all three modules, \$59.95. Requires: 2MB RAM, 4MB hard disk space, Microsoft Windows 95. Impact Software, Chino, CA; 800-777-7687, 909-590-8522; fax, 909-590-2202.

Circle 438 on reader service card

FONTMINDER 3.0

FontMinder, the leading TrueType and Type 1 font management program for Windows 3.x, now extends its Font Pack technology and font-viewing abilities to the Windows 95 environment. The \$79.95 program lets you organize your fonts into groups and adds a unique feature that converts any of the possible variations of Type 1 Multiple Master fonts into a standard Type 1 or TrueType font.

Using an elegant drag-and-drop interface, FontMinder organizes groups of fonts into Font Packs that the program can install or remove in a single operation. The program also optionally associates fonts with specific applications or even documents. The result is that you can run FontMinder, click on a Font Pack, and automatically install the fonts in the Font Pack and start the associated program.

No other font utility offers so much control over so many kinds



CLEANSWEEP 95™ FOR WINDOWS 95™ WILL UNINSTALL ALL YOUR OBSOLETE PROGRAMS. (LIKE, OH FOR INSTANCE, UNINSTALLER.®)

Sorry Uninstaller, but the new Quarterdeck® CleanSweep 95 just swept you under the carpet. While you may be excellent at uninstalling those bitty 16-bit programs, that skill won't get you very far in Windows 95.

Windows 95 is big, with big 32-bit programs. CleanSweep 95 is smart and powerful, with native 32-bit power to remove any program in the Windows 95 world – both 16- and 32-bit.

And it does it much faster than other (uh-hmmm) uninstallers, so you don't have to twiddle your thumbs for hours every time you uninstall something, archive it or

go searching for leftover bits of unwanted files.

Quarterdeck CleanSweep 95 is also much safer to use than other uninstallers. Much easier, too. Wizards do most of the work for you – all that's left to do is simply click.

To see for yourself everything CleanSweep 95 can do, call 1-800-683-6696 for your free trial edition. Or you can download a copy from our website at www.qdeck.com.

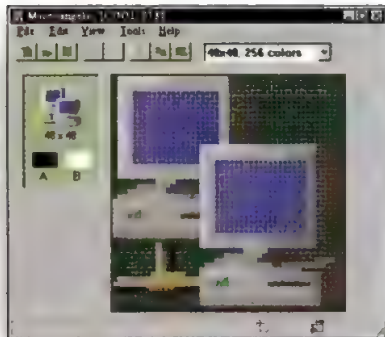
Even better, pick up the real thing at your computer store. You'll get ten dollars off just for bringing in any old uninstaller.* Don't worry, we'll find a good home for it.



CIRCLE 337 ON READER SERVICE CARD

First Looks

of fonts. FontMinder's dialog boxes let you rename fonts and change the characteristics that they report to Windows. Other FontMinder windows display and can print elaborate and accurate font samples, while others let you archive fonts in the LHArc format, delete fonts, or manually di-



DESIGN YOUR OWN: Microangelo's Studio contains an icon editor that supports new formats such as this 48- by 48-pixel, 256-color icon.

vide fonts into categories.

If you use Type 1 Multiple Master fonts, FontMinder's dialog box for creating instances of these fonts is easier to use than the one in Adobe Type Manager. Its feature that converts a Multiple Master instance to a TrueType font produces a font that's not as well hinted as the original, but good enough for most purposes.

Anyone who works with fonts on a daily basis and uses Windows 95 will want this program—and most of its features also work under Windows 3.x.—EM

FontMinder 3.0. List price: \$79.95. Requires: 4MB RAM, 2MB hard disk space, Microsoft Windows 95 or Windows 3.x. Ares Software Corp., Foster City, CA; 800-783-2737, 415-578-9090; fax, 415-378-8999.

Circle 437 on reader service card

WINZIP 6.0

Nico Mak Computing's \$29 WinZip 6.0 follows in the tradition of earlier versions of the program by providing an elegant utility that integrates support for compressed archives into Microsoft Windows 95.

Like past efforts, WinZip is an interface for zipping and unzipping files, but does not contain the compression program itself. You need to have one of the necessary

DOS-based compression packages—such as PKZIP or LHA .EXE—for WinZip 6.0 to act as a shell. In addition to the popular .ARC, .ARJ, and .LHA formats, WinZip now supports several popular Unix formats—including .GZ, .TAR, .TAZ, .TGZ, and .Z—that are used on the Internet.

From WinZip's main window we found it easy to extract, run, and add files to and from any compressed archive. You add files to an archive by dragging them from the Explorer or the Desktop to an archive. The program lets you insert an Add to Zip menu choice in Windows 95's Explorer. Click on this menu item and WinZip adds the highlighted files to a new or existing Zip file. If you like, WinZip 6.0 can be linked to an antivirus program and configured to screen your incoming downloads for infections.

If you use compressed files often, you'll want WinZip 6.0 in your armory of file management tools.—BS

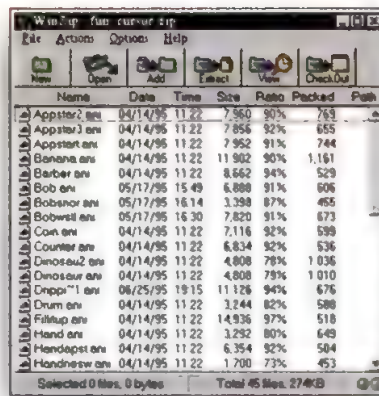
WinZip 6.0. List price: \$29. Requires: 4MB RAM, 1MB hard disk space, Microsoft Windows 95 or Windows NT. Nico Mak Computing Inc., Bristol, CT; 800-242-4775, 713-524-6394; fax, 713-524-6398.

Circle 482 on reader service card

DRAG AND FILE

Canyon Software's Drag and File and Drag and Zip are two utilities that give a great deal of power to the mouse in Windows 95. Drag and File is a high-efficiency, no-nonsense \$35 file management utility for Windows 95. Drag and Zip adds the ability to create self-extracting compressed files.

Drag and File performs all standard file management tasks through keyboard shortcuts or the use of efficiently designed dialog boxes. The display uses the familiar metaphor of a directory tree on the left and a file list on the right, but the program stands out for its clarity



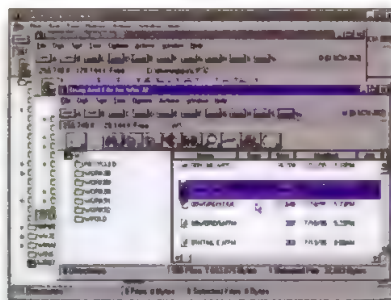
DISCOVER: WinZip 6.0 displays zipped files along with pertinent details.

and the intelligence it imparts to file management. Drag and File can use industry-standard formats such as 4DOS/NDOS file descriptions.

A powerful DOS command-line utility within Drag and File optionally stays open at the foot of the screen. A dialog box lets you associate file types with more than one application, and when you launch a file from the file list, the program asks you which application to open. Virtually all features, including complex sorting options, are accessible from intuitive keyboard shortcuts.

A \$30 companion program, Drag and Zip, adds PKZIP support to Drag and File's menus or functions as a standalone. Drag and Zip's feature set resembles that of Nico Mak Computing's classic WinZip 6.0, complete with a check-out feature that lets you try out a zipped program from a temporary directory. There's also a module for creating Windows-based self-extracting files.

Neither of the Canyon Soft-



FIND IT: Drag and File uses the familiar File Manager metaphor to navigate through Windows 95.

ware programs looks especially elegant, but both are compact, efficient, and fast.—EM

Drag and File. List price: \$35. **Drag and Zip.** List price: \$30. Requires: 8MB RAM, 2MB hard disk space, Microsoft Windows 95. Canyon Software, San Rafael, CA; 800-280-3691, 415-453-9779; fax, 415-453-6195.

Circle 420 on reader service card

VIEWER95

Mastersoft's \$79 Viewer95 displays and converts 150 popular file formats through a standalone viewer or as an item in the right-click menu of Windows 95's Explorer and the Tools menu of other applications.

As a standalone program, Viewer95 displays a directory tree and a viewer pane. It lets you find files by searching for text or filenames and displays files in draft, hex-dump, page-layout, or text-formatted modes.

A toolbar lets you detach viewing windows, launch the original application, print the file, or compare two files and display the differences in redline and strikeout form. Other functions include basic file management, displaying and extracting .ZIP files, or UUE encoding and decoding for files transferred from the Internet. The directory screen is short on keyboard shortcuts but is otherwise easy to use.

As a right-click pop-up menu, the basic viewing functions take the place of Windows' Quick-View feature and appear when you choose Quick View from the menu. Multiple columns aren't displayed—not even in page view—but graphics, tables, and spreadsheets are displayed well; database files appear in spreadsheet format. Mastersoft's conversion filters are mature and powerful but the filters can get confused by complex page layouts.—EM

Viewer95. Estimated street price: \$79. Requires: 2MB RAM, 14MB hard disk space, Microsoft Windows 95. Mastersoft Inc., Scottsdale, AZ; 800-624-6107, 602-948-4888; fax, 602-948-8261.

Circle 439 on reader service card



RAM.



RAM DOUBLERS.



MAGNARAM.

Now that MagnaRAM's around, you'll be seeing a lot fewer "RAM doublers" in the neighborhood. How can they possibly compete against the 32-bit memory multiplying power of MagnaRAM?

MagnaRAM doesn't double. It multiplies. It takes your physical memory and compresses it until you have maximum memory. And it combines this ultra-safe compression technology with a proprietary method for improving virtual memory speed.

It's a good combination because it means you have more usable memory for Windows® 95 and Windows 3.1. You can open more and bigger programs without getting that annoying little "out of memory" box. And because you don't go to the disk as often, the programs run much faster.

The proof is charted on a simple, graphical screen. If you want to see how much your system's memory and performance has improved, you can easily find out.

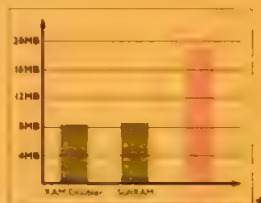
If you want to fine-tune speed and memory, you can do that, too. MagnaRAM is fully configurable.

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Best of all, MagnaRAM costs a lot less than you'd pay for RAM chips or SIMM modules.

To find out more, see your retailer, visit our website at www.qdeck.com, or give us a call at 1-800-683-6696.

(No cute little puppies were harmed in the making of this ad.)



CIRCLE 338 ON READER SERVICE CARD

*Test was performed using an HP 486/33M, 16 MB RAM, running Windows 3.1. Software: Microsoft Works, Lotus 1-2-3, MS-DOS, Shortcuts, Light, Corel Draw 3.0, Adobe Photoshop, AutoCAD, and more. Test conducted with products available at the time. ©1996 Quarterdeck Corporation. All rights reserved. MagnaRAM is a registered trademark of Quarterdeck Corporation. All other trademarks are the property of their respective owners.

Notebooks

Continued from page 37

play is powered by a 32-bit local-bus Cirrus Logic graphics chip that turned in a 8.9-million-pixels-per-second score on our Graphics WinMark 95 tests, which was slightly below average. The Ascentia we tested, which came with 16MB of RAM and an 800MB hard disk, posted a lukewarm Winstone 95 score of 103, and was bested by the Pentium/75-based Toshiba Satellite Pro 400 CDT, which achieved a score of 110. This Winstone 95 showing is in part due to the Ascentia's below-average Disk WinMark 95 score of 388.

In terms of battery life, things brightened up a bit for the Ascentia. Its lithium ion battery lasted a respectable 2 hours 21 minutes on our WinDrain battery test, where power conservation is turned off.

At \$5,548, the Ascentia might seem a bit expensive given its features, its performance, and the lack of a CD-ROM option.—*Tin Albano*

Ascentia 950N. Estimated selling price: With Pentium/90 CPU, 16MB RAM, 800MB hard disk, 10.4-inch SVGA active-matrix color display, \$5,548. AST Research Inc., Irvine, CA; 800-876-4278, 714-727-4141; fax, 800-926-1278.

Circle 432 on reader service card

GATEWAY 2000 SOLO S90

Gateway 2000 has been a consistent leader in the desktop PC market but has lagged behind the industry leaders in the notebook arena. One look at the \$4,999 Solo S90 is all it takes to realize that Gateway is now running neck-and-neck with IBM and Toshiba.

The 2.0- by 11.8- by 8.8-inch, 6.3-pound Solo is svelte, especially when you consider the built-in double-speed CD-ROM drive. The unit comes with a floppy disk drive module, but you can't use the module at the same time as the CD-ROM. The Solo is a true portable multimedia PC with its 16-bit sound and integrated microphone; two stereo speakers are located at the lower corners of the screen. The sound quality is far

and away the best we've heard from a notebook without the aid of external speakers.

Like the Ascentia 950N, the Solo sports a 10.4-inch Super VGA active-matrix color LCD panel. The notebook displays 256 colors at a resolution of 800-by-600 pixels.

The Pentium/90-equipped Solo we tested featured 16MB of RAM, a 720MB hard disk, and room for two Type II PC Cards or one Type III PC Card. Except for its performance on our DOS Video tests, the Solo scored above the averages for Pentium/90 notebooks. The unit achieved a Winstone 95 score of 119 and a Graphics WinMark 95 score of 9.8 million pixels per second. To go along with these blistering performance numbers, the Solo's lithium ion battery lasted 2 hours 27 minutes on our WinDrain battery test.

With the Solo S90 and its Editors' Choice-winning Liberty subnotebook, Gateway 2000 has two portable PCs that just may take the notebook market by storm.—*TA*

Solo S90. List price: With Pentium/90 CPU, 16MB RAM, 720MB hard disk, 10.4-inch SVGA active-matrix color display, modular CD-ROM drive, \$4,999. Gateway 2000 Inc., N. Sioux City, SD; 800-846-4509, 605-232-2000; fax, 605-232-2023.

Circle 433 on reader service card

TI EXTENSA MODEL 450

Well known for its high-powered portable systems, Texas Instruments is now aiming at the middle of the market with the \$2,679 TI Extensa Model 450. While this notebook rivals many subnotebooks in size, it also has a built-in floppy disk drive.



SWAPPABLE DRIVES: Gateway 2000's Solo S90 lets you swap between a double-speed CD-ROM drive and a 3.5-inch floppy disk drive.

Designed by TI and built in Taiwan, the Extensa 450 is based on a DX4/75 processor and powered by nickel hydride batteries (lithium ion batteries will be available sometime this fall). The system uses a high-performance PCI bus and users have a choice between a 9.5-inch active-matrix color display and the 10.4-inch

dual-scan color that was featured on our test unit.

As far as expansion goes, the Extensa 450 has a Type II PC Card slot, but you can trade the floppy disk drive for a Type III PC Card slot that can alternatively take a pair of Type II cards. You're likely to need this added expansion potential, as the Extensa does not have built-in sound and the largest hard disk available at press time was 340MB. The unit includes parallel and PS/2 connectors, as well as a serial infrared communications window. The optional \$149 Port Replicator adds parallel, serial, and VGA ports, as well as a second PS/2 port. If the Replicator is too much to carry, TI includes a Port Enabler with minimal connectors.

The Extensa uses a touchpad that is mounted in the middle of a large and comfortable wrist rest. While the activation buttons are conveniently placed, the touchpad can feel cramped, as it is about one-third smaller than most of the other touchpads we've seen.

The Extensa 450 was equipped with Microsoft Windows 95, and as a result could not run our DOS-based benchmark tests. On our Winstone 95 tests, the system posted a score of 39—about what was expected of a DX4/75 system running Windows 95. The only disap-

BENCHMARK TESTS



Notebooks

The Pentium/90-based Solo S90 from Gateway 2000 led the pack with its Winstone 95 score of 119. On the other hand, AST's Pentium/90-powered Ascentia 950N turned in Winstone and Graphics WinMark 95 results that were well below the average for Pentium/90 notebooks, and in several cases it could hardly compete with Toshiba's Pentium/75-

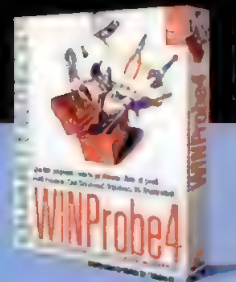
based Satellite Pro 400 CDT. The TI Extensa 450, equipped with a DX4/75 CPU and Microsoft Windows 95, met our modest expectations. The Ascentia 950N, Solo S90, and Satellite Pro 400 CDT all ran Windows 3.11.

We used Winstone 95, Version 1.0; WinBench 95, Version 1.0; and PC Bench, Version 9.0, to measure the performance of these notebooks. In addition, we used the WinDrain test to gauge battery life. Each system was equipped with 16MB of RAM.

	Winstone 95	Graphics WinMark 95 (Mpixels/sec)	Disk WinMark 95	DOS-Mark	CPU-Mark ₁₅	DOS Video	DOS Disk	WinDrain (hours:minutes)
Higher scores represent better performance								
AST Ascentia 950N (Pentium/90)	103	8.9	388	695	186	2,887	396	2:21
Gateway 2000 Solo S90 (Pentium/90)	119	9.8	507	815	185	2,089	653	2:27
TI Extensa 450 (DX4/75)	39	1.8	405	N/A	N/A	N/A	N/A	1:53
Toshiba Satellite Pro 400 CDT (Pentium/75)	110	8.1	526	723	151	2,959	495	2:12
WinBook XP (DX4/100)*	47	5.0	433	N/A	N/A	N/A	N/A	1:49
Average Pentium/75 notebook (August 1995)	94	8.8	399	694	157	3,065	458	2:12
Average Pentium/90 notebook (August 1995)	114	9.7	485	574	179	2,881	328	1:42

*Reported for comparison

N/A—Not applicable. The system was running Windows 95 and could not perform our DOS-based tests.



Nothing gets by WinProbe™. That's what makes it the most powerful and comprehensive troubleshooter toolbox for both Windows® and Windows 95.

If there's a problem hidden in your system, WinProbe will let you know while there's still time to do something about it. If there isn't a problem, 300 or so tune-up suggestions will help you keep it that way. It does everything a technician would do – except send you a bill.

Using non-destructive testing technology, WinProbe searches out problems, performs more than 200 tests, automatically optimizes your system resources – even gives you more available RAM by

**IT SAYS YOUR
MEMORY IS FRAGMENTED.
YOU HAVE A
FAULTY RAM CHIP,
YOUR SYSTEM REQUIRES
OPTIMIZING,
YOU HAVE A CACHE
HIT RATE OF 48%
AND YOUR FLYING
TOASTER SCREEN SAVER
IS GETTING A LITTLE
MONOTONOUS.**

automatically defragmenting your Windows and Windows 95 memory. And all the while it keeps you informed on a real-time status panel like the one above.

Your part is easy. Because WinProbe works within Windows 95 and Windows 3.1, there's none of that popping in and out of DOS that seems to be such a popular theme among other troubleshooters. You get to work in a familiar environ-

ment, using the powerful features of Windows.

To find out more, see your retailer, visit our website at www.qdeck.com, or give us a call at 1-800-683-6696. And do something about that paisley mousepad will you?

First Looks

pointment was the model's subpar Graphics WinMark 95 score of 1.8 million pixels per second, which is likely the result of its Cirrus Logic CL video chip set. The system lasted just under 2 hours on battery power.

At 1.7 by 8.2 by 11.7 inches (HWD) and a with travel weight of 6.3 pounds, the Extensa 450 is slightly larger and heavier than the Editors' Choice-winning Gateway Liberty subnotebook. But the TI unit includes a built-in floppy disk drive and costs one-third less. All the Extensa needs now are more powerful processor options.—*Brian Nadel*

TI Extensa Model 450. List price: With DX4/75 CPU, 16MB RAM, 340MB hard disk, 10.4-inch dual-scan color display, \$2,679. Texas Instruments, Temple, TX; 800-



FLOPPY'S INSIDE: The TI Extensa Model 450 is the size and weight of a subnotebook, but it has a built-in floppy disk drive.

848-3927; email, 2ti@msg.ti.com. Circle 434 on reader service card

TOSHIBA SATELLITE PRO 400 CDT

One of the two notebooks in this review equipped with an internal CD-ROM, the Toshiba Satellite Pro 400 CDT packs a lot of power and features for its \$5,328 price tag.

The Satellite Pro we tested included a Pentium/75 CPU, 16MB of RAM, a 772MB hard disk, an integrated quad-speed CD-ROM drive, a modular floppy disk drive, and a 10.4-inch active-matrix color display. The floppy disk drive can be used either internally—in place of the CD-ROM—or externally, as a standalone unit concurrent with the CD-ROM. Uniquely, the sys-

tem includes a drive case, cable, and connector for the floppy disk drive. There's also a Type III PC Card slot that can accept a pair of Type II PC Cards.

The industrial-strength case builds upon the design of previous Satellite notebooks, adding a sturdier keyboard and a more comfortable wrist rest; the keyboard now includes Toshiba's AccuPoint keyboard-mounted pointing stick. You'll find a serial port on the left side of the unit, and infrared, parallel, PS/2, and video ports in the rear; the AC adapter is integrated into the notebook.

The Satellite Pro, with a travel weight of 7.6 pounds, comes with all of the equipment necessary to take advantage of today's sound and recording features. The unit's integrated 16-bit sound is compatible with the Sound Blaster Pro standard. A microphone is located at the lower-right corner of the notebook's display, while the volume control, headphone jack, and built-in speaker are all located at the front of the unit.

The Satellite Pro uses a lithium ion battery that lasted 2 hours 12 minutes on our WinDrain test. But beware: The CD-ROM can drain the battery, even when it's not in use.

For a Pentium/75 unit, the Satellite Pro turned in exceptional performance on some benchmark tests, rivaling that of systems with Pentium/90 processors. Its overall Winstone 95 score of 110 came close to the average for Pentium/90 machines. The unit's performance on our Graphics WinMark 95 tests was lackluster, but the Satellite Pro excelled on the Disk WinMark 95 and DOS-Mark tests.

If you like Toshiba's lightweight Portégé machines but need a more full-featured, multimedia-savvy notebook, the Satellite Pro represents a solid choice. With its quad-speed CD-ROM drive and state-of-the-art processor, the Satellite Pro 400 CDT rivals the power of many desktop systems.—*Melissa J. Perenson*



QUAD-SPEED POWER: Toshiba's Satellite Pro 400 CDT features a quad-speed CD-ROM drive and state-of-the-art processor.

Satellite Pro 400 CDT. List price: With Pentium/75 CPU, 16MB RAM, 772MB hard disk, 10.4-inch active-matrix display, quad-speed CD-ROM drive, \$5,328. Toshiba America Information Systems Inc., Irvine, CA; 800-334-3445, 714-583-3000; fax, 714-583-3800.

Circle 435 on reader service card

HiNote Ultra Finds Its Voice

Already the thinnest notebook available, Digital Equipment Corp.'s HiNote Ultra takes on a new voice with the addition of the \$899 Mobile Media Module. The 2-pound CD-ROM/sound module consists of a double-speed CD-ROM drive and a trio of speakers. It changes the HiNote Ultra into a multimedia machine.

The 0.8- by 11.0- by 8.5-inch (HWD) Mobile Media Module snaps to the bottom of any HiNote Ultra system; the 1.5- by 11- by 7.7-inch HiNote Ultra/multimedia combination weighs about 6 pounds. You can hot-swap the wedge-shaped floppy disk drive for the CD-ROM drive—but you can't connect both at once. While the CD-ROM drive is rated at 300 kilobytes per second (KBps), our testing showed the system capable of only 289 KBps of throughput; this slightly subpar number shouldn't affect performance.

The Mobile Media Module includes software for playing audio CDs, and the sound quality is impressive, because of the pair of stereo speakers

in front and a third downward-pointing speaker in the base's bottom. There's a convenient thumb-wheel for adjusting volume and a headphone jack for private listening, as well as a MIDI port for composing music.

Whether you use it for listening to music, loading software, playing games, or CD-ROM work, the CD-ROM drive soaks up battery time. The lithium ion battery in the DX4/75-equipped HiNote Ultra CT475 we tested lasted for 1 hour 47 minutes with the CD module attached—about 30 minutes less than the battery lasted without an attached module.

If you're considering extending the usefulness of a HiNote Ultra by adding a CD-ROM drive and speakers or are interested in a 6-pound multimedia-ready CD system, look no further than Digital's Mobile Media Module.—*BN*

Mobile Media Module. List price: \$899. Requires: Digital HiNote Ultra notebook. Digital Equipment Corp., Maynard, MA; 800-642-4532.

Circle 407 on reader service card



SNAP-ON SOUND: The Mobile Media Module adds a double-speed CD-ROM drive and speakers to the HiNote Ultra.

UPGRADE CPUs

Intel's 83-MHz OverDrive: The Cost-Conscious 486 Upgrade

By Sebastian Rupley

Designed to rev up 486DX/33- and DX2/66-based PCs, Intel Corp.'s \$299 83-MHz Pentium OverDrive Processor delivers on the promise of performance, but its toughest competition may end up being a new crop of budget-priced full systems. Our testing shows that the 83-MHz OverDrive CPU can boost typical

get inside our Gateway 2000 486DX2/66 test system and install the OverDrive chip. The chip will upgrade most 486-based systems with 237- or 238-pin processor sockets but is expressly designed for 33- and 66-MHz 486 PCs. A list of over 2,800 systems appropriate for the upgrade is available at Intel's World-Wide Web site (<http://www.intel.com/procs/compass/ovdr.html>).

The OverDrive chip has an ingenious on-board cooling fan. When you boot up your system, a software utility monitors the CPU temperature and controls the fan. If the fan stops or stutters, the utility automatically slows the chip's clock speed until the temperature drops.

The OverDrive's performance on our application-based Winstone 95 benchmark tests was 32 percent better than that of the 486DX2/66



POWER RUSH: Intel's 83-MHz Pentium OverDrive Processor boosts a 486 PC's performance.

performance by more than 30 percent.

Like the 63-MHz OverDrive processor, the 83-MHz chip combines a 3.3-volt, 0.6-micron Pentium processor core with some unavoidable 486-chip architectural baggage. The OverDrive has the superscalar architecture, fast floating-point unit, and branch prediction of a true Pentium. The 486's 32-bit bus is carried over (in contrast to the Pentium's 64-bit bus) to retain compatibility, however. Processor cache—a boon to performance—has been increased to 32K, compared with the Pentium's 16K.

The physical upgrade to the 83-MHz CPU is painless: It took us less than 5 minutes to

UPGRADE ACCESSORIES

Merritt's No Noise: The Quiet Fan

By Steve Buehler

Merritt Computer Products' \$49.95 No Noise monitors your PC's temperature and controls its fan speed to keep the system cool and quiet. Unfortunately, installation difficulties might be enough to convince you that the original fan noise wasn't so bad, after all.

test-bed. Our CPUmark₁₆ processor tests showed the chip provided a 33 percent performance boost over the base DX2/66 system. The chip provided the biggest boost on floating-point, math coprocessor tasks; scores doubled (results not shown). When running word processing applications, which don't need a lot of CPU muscle, the OverDrive upgrade bettered the base DX2/66 system by less than 29 percent (results not shown).

As Intel moves forward with its

goal of Pentium PCs at rock-bottom system prices, OverDrive processors are definitely second-best or interim solutions. For those on limited budgets, though, the OverDrive will provide a welcome shot of PC adrenaline.

83-MHz Pentium OverDrive Processor. List price: \$299. Requires: 486 PC with either a 237- or 238-pin upgrade socket. Intel Corp., Santa Clara, CA; 800-538-3373; fax-back, 800-525-3019.

Circle 405 on reader service card

BENCHMARK TESTS



83-MHz Pentium OverDrive Processor

The 83-MHz Pentium OverDrive CPU increased the performance of our 66-MHz 486DX2 test system by more than 30 percent on both the Winstone 95 and CPUmark₁₆ benchmark tests.

We used Winstone 95, Version 1.0, and PC Bench, Version 9.0, to gauge the performance of a Gateway 2000 486DX2/66 PC before and after upgrading it with an 83-MHz Pentium OverDrive CPU. The system contained 16MB of RAM.



quickly resumes 12-volt operation, bringing the fan to full speed.

We tested No Noise on a 486-based PC in our anechoic chamber at ZD Labs. Before installation, we measured the noise from the power-supply fan at a distance of half a meter—typical for a desktop arrangement—and came up with a reading of 44 decibels (dB). After we installed No Noise, the noise dropped to 38 dB. Because the decibel scale is logarithmic, this would mean about a 25 percent reduction in perceptible sound.

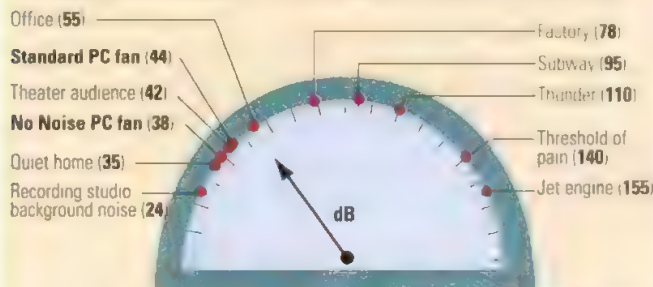
While opening up the PC to add a sound card or an additional hard disk isn't a big deal for most savvy computer users, opening the power supply (and voiding its warranty along the way) and splicing the fan's power cable will probably scare off a lot of these same folks. This puts No Noise squarely in the realm of OEM or VAR upgrades.

No Noise is in its element in places where quiet is a necessity. **No Noise.** List price: \$49.95. Merritt Computer Products, Dallas, TX; 800-627-7752, 214-339-0753; fax, 214-339-1313.

Circle 403 on reader service card

Sounds of Silence

With Merritt's No Noise thermostatic control attached to a PC's fan, extraneous sound was reduced by 6 decibels. We used an anechoic chamber to measure the sound levels of a standard PC's power-supply fan with and without No Noise.



Source: Principles of Digital Audio by Ken C. Pohlmann



From October 9 to October 13, you can go on-line to discuss Intel's 83-MHz OverDrive Processor with Intel's Bob Bennett and Sebastian Rupley, a senior editor at PC Magazine. Type GO EXEC at any CompuServe prompt.

INTERNET SOFTWARE

Explore New Internet Worlds with MindQ's Knowledge Odyssey

By Bruce Brown

For a thorough introduction to Internet exploration, look to MindQ Publishing's \$49.95 *The Internet: A Knowledge Odyssey, Basic Edition*. With cross-reference hyperlinks throughout, this CD-ROM-based, multimedia-laced tutorial and reference work teaches you all you need to know—at your own pace.

Organized into ten tours, *Knowledge Odyssey* simulates touring Internet resources, including home pages of a variety of World-Wide Web sites. You can jump between them or go immediately to specific topics via an on-screen index. The animated tours aren't always engrossing, but they are thorough and you control the pace. A helpful glossary with pop-up screens and related-term references is always available.

Information about the Internet's origins, commercial applications, and the Internet Society is included in the tours, as are video clips and narration by Dr. Vinton Cerf, president of the Internet Society. Once you've had your fill of virtual Net touring, you can switch to live access. The CD-ROM includes seven days' free use of Performance Systems International's Instant InterRamp software, as well as a month's trial membership on America Online; both programs provide Web access.

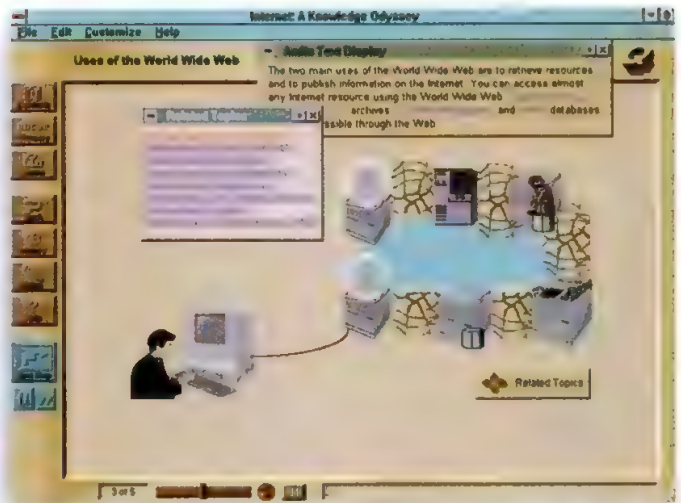
Knowledge Odyssey also includes information on accessing the Net via CompuServe and Prodigy, as well as a variety of other access methods. If you already have Internet access and browser software, you can use them in conjunction with *Knowledge Odyssey*—thereby retaining access to the program's help and reference material.

Several versions of *Knowledge Odyssey* are or will be available. The Basic Edition includes a variety of sites and general-purpose reference materials. Other editions are tailored to the needs and interests of

home users and businesses. Educational, government, international, and scientific editions may follow, as may an edition designed specifically for accessing and using the Internet via The Microsoft Network.

You can get by with less than 8MB of RAM, a VGA display (though you'll really want to use Super VGA), and no sound (narration will be displayed in text boxes), but you won't be able to take advantage of the program's multimedia features.

MindQ's *The Internet: A Knowledge Odyssey* is an informative and comprehensive program that will prepare you for the Internet.



ON-LINE TRAVEL GUIDE: *The Internet: A Knowledge Odyssey, Basic Edition*, prepares you for your own Internet adventures.

The Internet: A Knowledge Odyssey, Basic Edition. List price: \$49.95. Requires: 4MB RAM (8MB recommended), 2MB hard disk space, CD-ROM drive, Mi-

crosoft Windows 3.1 or later. MindQ Publishing Inc., Vienna, VA; 800-646-3008, 703-938-3579; fax, 703-938-9720.

Circle 402 on reader service card

WINDOWS DATABASES

DataEase Moves Uneasily to Windows

By Sheryl Canter

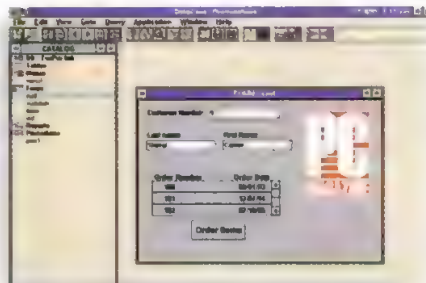
DataEase established itself in the DOS world as an easy-to-use but powerful database system. DataEase 5 for Windows (DFW), \$495 from DataEase International, is the company's first full-featured Windows database system for professional developers. Versions are also available for DOS and OS/2; they're designed to be transparently compatible.

DFW is not as easy to use as many of its competitors, particularly when you're trying to connect to existing databases in foreign formats. You can import a limited number of foreign formats, but first you have to create a form manually that mirrors the database structure. Even with dBASE files where the needed information is available, DFW will not create the forms.

You can create joins between tables and establish referential integrity rules, but again the pro-

cedure is awkward. DFW uses a combination of a dialog box and a table to set and display the relationships, which is not as user-friendly as the graphical drag-and-drop interfaces that some competing products use.

DFW uses visual designers for creating forms and reports, and it comes with a powerful scripting



KEEPING TRACK: The Catalog in DataEase 5 for Windows, Version 5.01, lists all the components in your database application.

language for customizing database applications. There is no runtime module for DFW; the full product must be distributed to end users. But you can prevent users from performing unwanted modifications by using DFW's document-level security system.

You assign a security level to each of eight different actions you can perform with a document, then you assign a security level to each new user.

Unfortunately, DFW is plagued by numerous small glitches, even with the patch disk available to correct the bugs reported in this release. For example, subforms with "no border" selected still show a partial border. We also experienced occasional crashes—you will get a GPF if you create a new report, select a chart object and place it on the form, and then click Cancel in the Chart Design dialog box.

If you are already using DataEase on another platform, you might want DFW. But if you are looking for a new Windows database system, it's hard to recommend this first release of DataEase 5 for Windows.

DataEase 5 for Windows, Version 5.01. List price: \$495 (upgrade, \$195 per user); server access five-pack, \$1,035 per user. Requires: 4MB RAM (6MB recommended), 10MB hard disk space (20MB recommended), Microsoft Windows 3.1 or later. DataEase International, Trumbull, CT; 800-243-5123, 203-374-8000; fax, 203-365-2317.

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DIGITAL PHOTOGRAPHY

Casio's QV-10: Digital Camera and Portable Slide Show in One

By Daniel Grotta and Sally Wiener Grotta

At less than half the size and weight of other filmless cameras, Casio's \$999 QV-10 can record nearly 100 24-bit color, 640- by 480-pixel images and display them either on the camera's color LCD screen, a PC's monitor, or even a television screen. The only thing the QV-10 design lacks is a built-in strobe flash.

The 7-ounce QV-10 comfortably fits in the palm of your hand. The camera's non-zoom, fixed-focus lens swivels 180 degrees so you can easily shoot a portrait of yourself at arm's length or even hold the camera overhead and still frame the subject accurately.



HANDY PHOTO STUDIO: Casio's QV-10's active-matrix LCD screen instantly shows your pictures.

That's because instead of using a hard-to-see optical viewfinder that is part and parcel of today's under-\$1,000 digital cameras, the QV-10 displays an image of the actual picture frame (which is updated about three times a second) on a built-in 1.8-inch color 480-by-240 active-matrix LCD screen. The LCD screen may also be used for instant image playback.

The QV-10 is the only camera under \$2,500 that has both digital and video output. The QV-10's LCD screen has the unique ability

to display both digital and video signals. Being able to upload up to 96 .BMP or TIFF image files (including charts and graphs) directly into the camera makes the QV-10 a powerful business presentation tool. All you do is create your slide show on your favorite presentation software, transfer the sequence of images into the QV-10's native memory, slip the camera into your shirt pocket, and take it to a client's office. For viewing, plug it into any television set. If there's no TV handy, you can simply put the QV-10 into the Play mode and view the presentation on the camera's own LCD panel.

By manipulating two buttons on the top of the camera, slide presentations can be programmed to advance images every 3 to 60 seconds. Images can also be manually moved backward or forward, and you can choose a view with either four or nine images per screen. Image quality of the integrated screen is comparable to that of the hand-held TV sets that are on the market, but the QV-10 can't handle the audio or multimedia aspects of a modern presentation.

Taking pictures is a snap, because there's little on the camera to adjust or set. It's not quite instantaneous; the camera pauses for 6.5 seconds to save and compress the image and reset the shutter. The electronic shutter automatically selects the appropriate shutter speed (from 1/8 to 1/4,000 second), though the user manually chooses between low-light (f2) and bright-light (f8) modes.

For optimum color balance, the QV-10 has



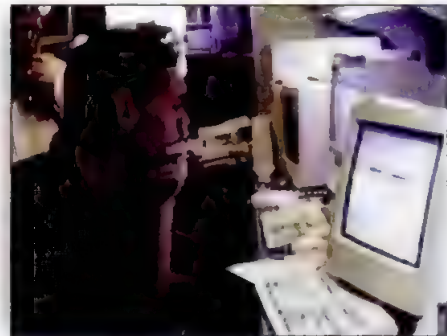
NEAR AND FAR: The QV-10's interface can view thumbnails of your digital photos or the full images.

automatic white balance built in. It also comes equipped with a self-timer, auto delete, and the ability to protect important pictures against accidental deletion. The QV-10 is capable of storing up to 96 640-by-480 color images in the camera's 1.6MB flash memory (each image is compressed to 25K). Unlike other cameras in its class, the QV-10 doesn't allow you to trade lower resolution for a greater number of shots.

Although the QV-10 has a phenomenal depth of field where, at f8, everything from 11 inches to infinity will be in focus, there is also a close-up switch for going still closer to the subject (from 2.5 to 8 inches). It's difficult to tell with any precision what will be in focus, however.

Uploading images to your PC or Macintosh (both cable and software kits are included) is easy to accomplish. The camera attaches to any serial port (from 9,600 to 57,000 bits per second), and installing the Windows-based QV-PC software is a no-brainer. At high

speed, it takes about 12.5 minutes to upload all 96 images. You can also globally save the



PICTURE VIEWER: Casio's QV-PC software saves images in a proprietary format as well as .BMP and TIFF formats.

images as .BMP or TIFF files, or in the QV-10's proprietary format, without first uploading. The QV-PC software has limited functions, so you'll probably want to use a more robust image-editing program. While evaluating the QV-10, we discovered three negatives of note: The product has no built-in flash, its image quality is limited by the small file size, and its selling price is geared more toward the business user and not the mainstream consumer.

But for presentations or fun snapshots, the QV-10 is in a class by itself.

QV-10. List price: \$999. Requires: 4MB RAM (8MB recommended), PC with serial port, Microsoft Windows 3.1 or later. Casio Inc., Dover, NJ; 800-962-2746.

Circle 411 on reader service card

FIRST LOOKS
From October 9 to October 13, go online to discuss digital photography with executives from Casio and Chinon and PC Magazine reviewers Daniel Grotta and Sally Wiener Grotta. Type GO EXEC at any CompuServe! prompt.

DIGITAL PHOTOGRAPHY

Chinon's ES-3000: A Point-and-Shoot Camera for the PC

By Brian Nadel

When you're shopping for a traditional point-and-shoot camera, you look for a technologically advanced design that includes sophisticated exposure control and an autofocus zoom lens. If you're looking for a filmless camera, your standards should be just as high. Enter Chinon's \$995 ES-3000 digital camera, which leapfrogs the competition by matching, feature for feature, today's best point-and-shoot film cameras.

Under the surface, the ES-3000 is a close relative of Kodak's DC-40 and Apple's QuickTake 150. That's because Chinon makes most of the parts for the other two cameras. What separates the three is the 7-mm to 21-mm zoom lens on the ES-3000, which can frame the same area as a 35-mm to 114-mm zoom lens on a 35-mm camera.

The lens has an f2.6 to f16 aperture and the camera's shutter speed ranges from 1/16 to 1/500 second. In addition, the ES-3000 has several focus modes, including spot focus, focus lock, and macro mode. The macro mode is useful for detail shots where the subject is up to 19 inches away from the lens. You can set the built-in flash for fill flash or automatic.

Getting started is quick and easy. Turn on the camera, aim it, adjust the zoom lens to frame the subject properly, and press the shutter button. The ES-3000 then saves the image in compressed format in its built-in 1MB memory. The camera can hold up to 5 superfine-resolution photos, 10 fine-resolution photos, 40 normal-resolution photos—or some combination of the three formats.

You can add up to a 16MB flash card in the camera's Type II PC Card slot; doing so boosts the camera's capacity to over 500 normal-resolution shots. The ES-3000 only works with Chinon-approved PC Cards for extra storage.

The differences among the image-quality modes are readily apparent when you view the

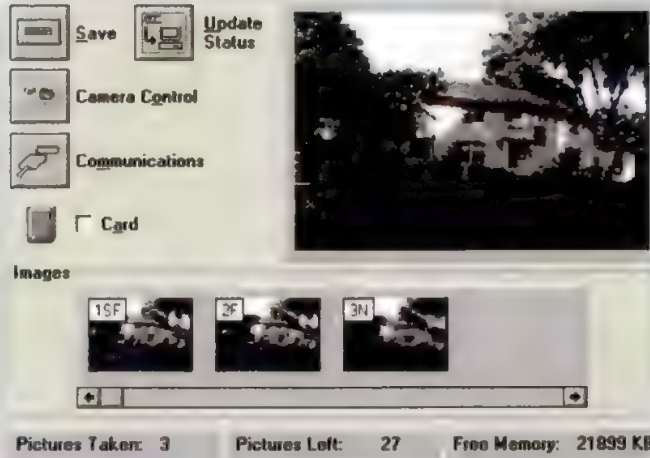


PHOTO PROCESSING: The ES-3000's interface lets you transfer images directly into a desktop publishing program.

prints from a high-quality printer. While all digital photos taken with the ES-3000 are 24-bit color, image fidelity varies. The superfine grade records a 640- by 480-pixel image without compression, while the fine grade records at the same resolution but sacrifices some image fidelity by compressing the image. Normal-grade images are limited to 320- by 240-pixel resolution.

At first glance, the normal-mode shots appear clear, crisp, and balanced; the fine and superfine images are each incrementally sharper. When printed on a high-quality color printer, the superfine images have excellent color balance and are just below the quality of film-based photographic prints. The ES-3000's major image problems concern aliasing and areas of high contrast that appear burned in.

To get the images out of the

camera and into your computer, Chinon provides a bare-bones interface and data-transfer system for both the PC and the Macin-



TRUE COLORS: Chinon's ES-3000 takes all its pictures in 24-bit color, but you can save the images in one of three modes.

tosh. Plug the camera into your PC's serial port and the system will move images either one at a time or as a batch. The system can save images in .DCT, .DIB,

and TIFF formats.

The ES-3000 includes a Twain driver so you can transfer images directly into an image-editing or desktop publishing program; the interface can be used as an Adobe plug-in module within another program. It took about 10 seconds to move a normal-mode image, while transferring fine and superfine images took 51 seconds and 93 seconds, respectively.

The interface gives you control over the ES-3000's operation as well as communications details between the camera and the PC, but it can't be scaled to full-screen. There's also a contact-sheet mode that can show thumbnails of six images at once. We were able to shoot about 200 photos per set of batteries, but data transfers drain the batteries much more quickly. Thankfully, Chinon includes an AC adapter with the ES-3000.

At 2.4 by 4.2 by 5.9 inches (HWD), the 18-ounce camera feels like an extension of your hand; there's even a built-in

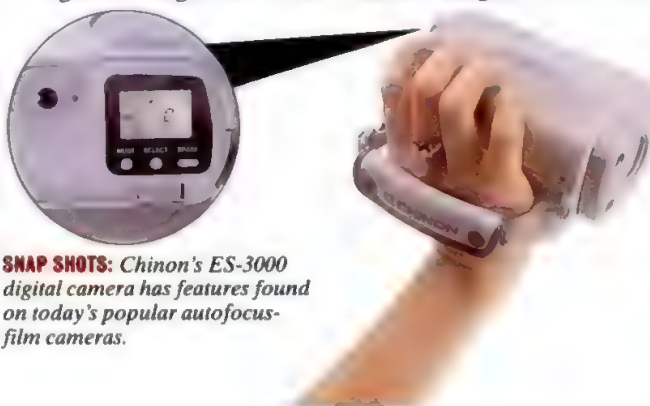
hand strap. The shutter and zoom-control buttons are within easy reach of your index finger when you place your hand in the strap. The camera's main design shortcoming is the size of the three buttons on the back of the camera that are used for erasing images and selecting the ES-3000's mode; they're too small for adult-

size fingers and we frequently had to use a pencil to set the camera's mode.

Whether you're looking to post up-to-the-minute photos on your personal World-Wide Web page or simply to snap some digital photos of the family, Chinon's ES-3000 is the filmless camera to beat.

ES-3000. List price: \$995. Requires: 4MB RAM (8MB recommended), 10MB hard disk space, Microsoft Windows 3.1 or later. Chinon America Inc., Mountain-side, NJ; 800-880-4164; fax, 908-654-6656.

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SNAP SHOTS: Chinon's ES-3000 digital camera has features found on today's popular autofocus-film cameras.

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CIRCLE 246 ON READER SERVICE CARD

MULTIFUNCTION PRINTERS

Speed Up Your Paper Flow with Xerox's WorkCenter 250

By Bruce Brown

A new multifunction printer from Xerox Corp., the Document WorkCenter 250, packs a lot of power into a small package. This \$699 SOHO ink jet system is by far the easiest unit to use from Xerox and takes the lead over competitive models by offering gray-scale scanning and printing.

At 15 by 15.75 by 16 inches (HWD), the WorkCenter 250 has the size and appearance of a standalone fax machine, but beneath the surface it's a four-way combination: printer, fax, copier, and scanner. The WorkCenter 250 starts with a 300-dot-per-inch (dpi), 3-page-per-minute (ppm), PCL3-compatible ink jet printer and adds a fax system that can send and receive documents at 9,600 bits per second. The WorkCenter 250 has a 300-dpi, 64-level gray-scale scanner as well as a jack for a telephone handset, and can work in conjunction with a standalone telephone answering system; the copier can duplicate, enlarge, reduce, and collate pages.

The WorkCenter 250 includes a Windows-based Control Center, Delrina's WinFax Lite, and Xerox's TextBridge Professional Edition 3.0 optical character recognition (OCR) software. If you install everything, you'll give up almost 13MB of hard disk space. An included Twain driver lets you scan directly from the WorkCenter 250 into most Windows graphics and image software.

Once this multitasking printer is installed—a process that takes just a few minutes—you can control operations from the intuitive front panel's four-line, 20-character LCD screen, or from your PC's screen. The paper tray holds 100 sheets and the automatic document feeder can hold 20 pages. You can feed letter-, legal-, and A4-size paper via the paper tray; envelopes, transparencies, and labels can be fed one at a time via a



manual single-sheet feeder. If you run out of paper or ink, up to 35 fax pages can be held in memory.

In testing, the WorkCenter 250 produced text pages at a typical ink jet printer speed of 2.5 ppm, and graphics pages at a more impressive 2.2 ppm. The quality of halftone images and text print samples was comparable to that of 300-dpi laser printers in terms of sharpness and



FOUR-IN-ONE: Xerox's Document WorkCenter 250 (left) prints, scans, faxes, and copies in a unit that's the size of a typical fax machine. Its output (above) realistically shows details that other multifunction products miss.

tone gradation. Graphics copying benefits from the unit's gray-scale capabilities, with much better results than what we've seen from single-bit systems.

If ink jet printing is adequate for your needs, the Xerox Document WorkCenter 250 is comparable to the \$800 Canon MultiPass 1000 (see First Looks, June 27, 1995), which doesn't have gray-scale abilities.

Easy to set up and use, the newest Xerox multifunction printer is the company's best effort yet.

Document WorkCenter 250. Estimated street price: \$699. Requires: 4MB RAM (8MB for OCR), 13MB hard disk space, Microsoft Windows 3.1. Xerox Corp., Palo Alto, CA; 800-832-6979.

Circle 428 on reader service card

PRINTER UTILITIES

See and Print All Your Fonts with Printer's Apprentice

By Barry Simon

If you're interested in viewing and printing all the fonts available on your system, Lose Your Mind Development's \$25 Printer's Apprentice, Version 6.0, provides the best way to preview, install, and print font specimen sheets via Windows. New to Version 6.0 are wizards that step you through common operations and a significant reduction in the resources demanded by the program.

One especially welcome wizard lets you scan a directory of TrueType fonts and print a catalog of some or all of the typefaces in a variety of formats, from one font per line to full-blown specimen

sheets. This wizard can even work with fonts that haven't been installed and is an ideal tool for coping with CD-ROMs containing hundreds of fonts. Printer's Ap-

prentice also can batch-print multiple specimen sheets at once.

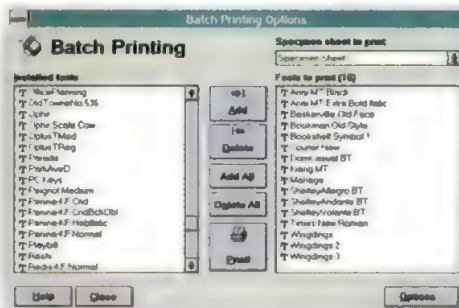
Other Printer's Apprentice wizards perform quick font installation, font removal (with the option of moving the font file to an archive directory), and tracking of leftover .FOT files for typefaces that are no longer in use.

Printer's Apprentice takes the lead over competing font management tools such as Ares' Font Minder and Elsewhere's Font Works Express. Yet Printer's Apprentice lacks the ability—present in both Font Minder and Font Works—to manipulate fonts in groups. This feature would allow users to avoid situations where font menus display hundreds of fonts.

If you want font management but don't need grouping capabilities, or if you need an adjunct to your existing grouping tools, Printer's Apprentice should be at the top of your list.

Printer's Apprentice, Version 6.0. List price: \$25. Requires: 4MB RAM, 6MB hard disk space, Microsoft Windows 3.1 or later. Lose Your Mind Development, Haverford, PA; 610-520-1648.

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BY THE BUNCH: Printer's Apprentice can perform batch printing of multiple specimen sheets.

prentice also can batch-print multiple specimen sheets at once.

Other Printer's Apprentice wizards perform quick font installation, font removal (with the option of moving the font file to an archive directory), and tracking of

STATISTICA

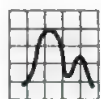
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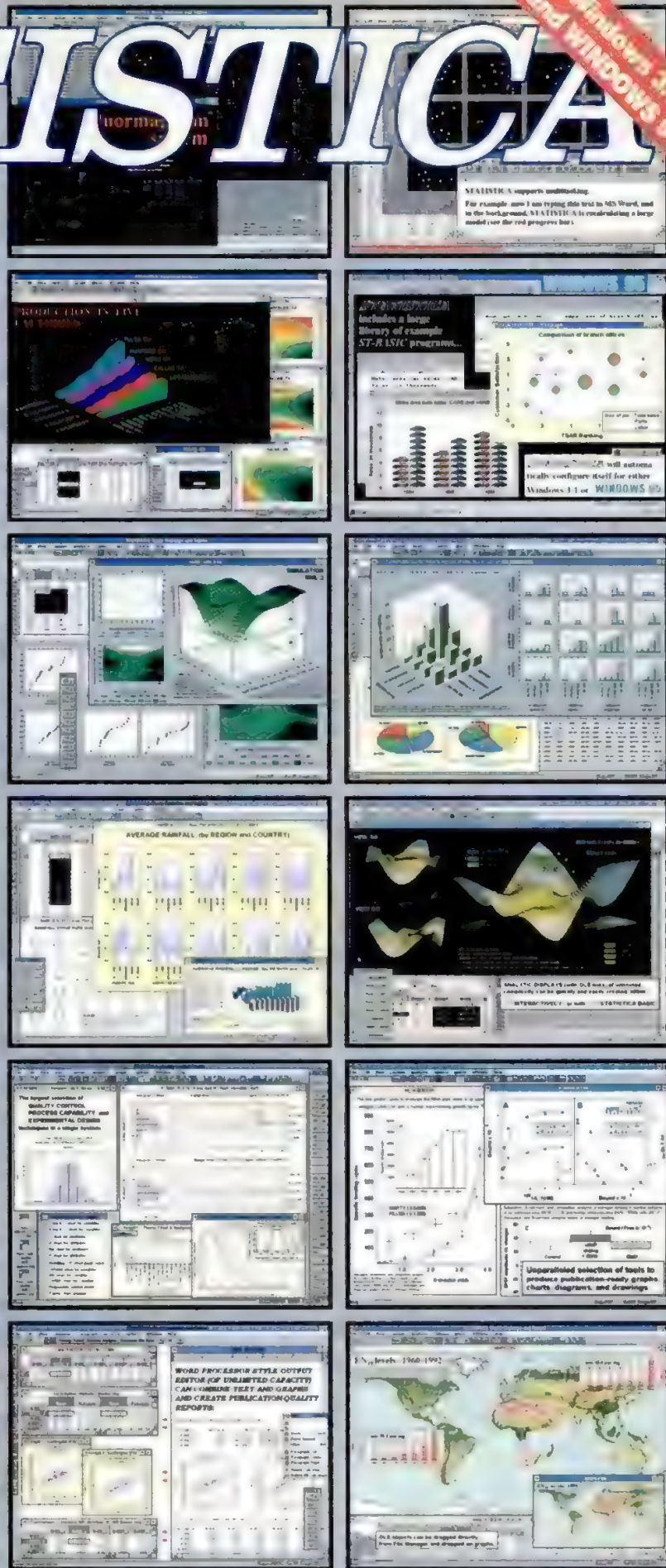
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WINDOWS 95 COMMUNICATIONS

QmodemPro Brings Communications into the Win 95 Era

By J.W. Olsen

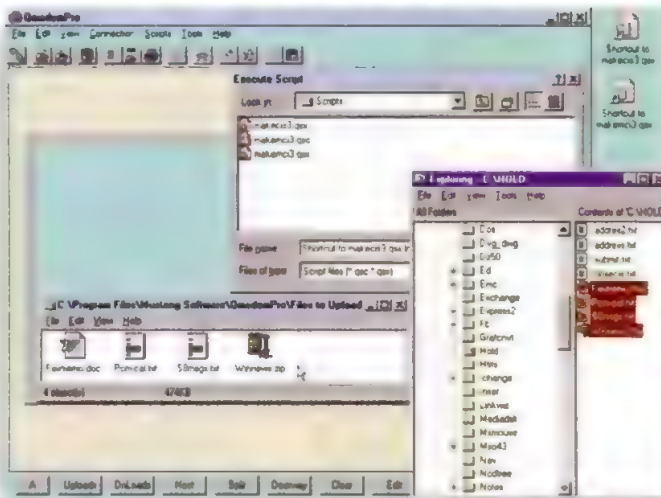
For all its advanced communications functionality, Microsoft Windows 95 omits a key ingredient of everyday computing: a powerful general-purpose telecommunications application. The HyperTerminal applet may do in a pinch but is woefully inadequate for heavy use. Many Windows 3.1 or DOS communications tools can't maximize Windows 95's capabilities, and at times they directly conflict with the new operating system's TAPI functions, such as answering incoming faxes. Mustang Software's \$129 QmodemPro for Windows 95, Version 2, uses Windows 95's communications features so effectively that the product is a joy to use; the implementation, however, is not perfect.

QmodemPro's TAPI compliance means you can call on-line services or use the product's host mode without modem conflicts with Microsoft Exchange's fax and dial-up networking functions. Mustang removed QmodemPro's previous internal fax functions in favor of meshing the program with Exchange. QmodemPro is also MAPI-compliant, so you can direct its text, graphics, and files via e-mail systems such as cc:Mail.

OLE 2.0 support in QmodemPro gets the job done, and at times is a real time-saver. For example, the program lets you drag and drop a phone-book entry's icon onto the desktop. Later, clicking on the icon automatically loads QmodemPro, dials your destination, and runs any associated script.

You create these and other types of scripts with Mustang's powerful and relatively easy-to-use, BASIC-like language (SLIQ). QmodemPro arrives with everything needed to develop scripts, including a syntax-highlighting editor, a compiler, a debugger, and a descriptive 328-page manual.

QmodemPro Internet support includes telnet mode and password encryption based on the MD5 algorithm that Mustang li-



SUCH A DRAG: Place favorite QmodemPro for Windows 95, Version 2, scripts on your desktop, ready for you to execute with a mouse-click.

censed from RSA Data Security. Telnet addressing is cleverly integrated into QmodemPro's dialing directory. Select telnet and the phone-number dialog box changes into a URL input box.

QmodemPro includes 35 terminal emulations, including popular RIPScrip and ten file-transfer protocols. If you need more esoteric terminal emulation modes, wait for Persoft's SmartTerm, 32-

Bit Edition for Windows 95, which is expected to ship by the time you read this. QmodemPro's own graphics viewer displays .BMP, .GIF, and .JPEG files during downloads.

There are scripts included for CompuServe, Delphi International, Genie, and MCI Mail. But during our tests these scripts often became confused and couldn't recover when characters were lost during calls, even at speeds of only 14,400 bits per second.

The two biggest problems with QmodemPro are these script weaknesses and the disconcerting number of characters lost during transmissions. But for now, QmodemPro sets the pace for Windows 95 telecommunications. Its on-line text and file transfers are fast, while its interface is simultaneously powerful and delightfully easy to use.

QmodemPro for Windows 95, Version 2. List price: \$129. Requires: 4MB RAM, 5MB hard disk space, Microsoft Windows 95. Mustang Software Inc., Bakersfield, CA; 800-999-9619, 805-873-2500; fax, 805-873-2599.

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ON-LINE SERVICE ADD-ONS

Tapcis 6.0 Makes It Easier to Manage CompuServe

By Joe Salemi

The Support Group's \$39.50 Tapcis 6.0 is a complete rewrite that sports an entirely new menu-driven interface, faster message indexing, and mouse support. Though still a DOS program, Tapcis is a CompuServe navigator that works equally well under Microsoft Windows 3.x and Microsoft Windows 95, and by allowing you to do more work off-line, it can save you money.

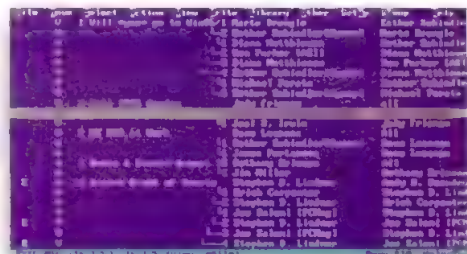
The main Tapcis screen is divided into the in-box, the out-box, and the forum/services list. You can switch among areas easily, giving you control over each on-line session. The in-box shows you which forums have messages waiting as well as new files found in the libraries; the out-box shows any pending actions. Tapcis's forum/services list shows the active forums.

Version 6.0 retains many of the function-key shortcuts that cur-

rent Tapcis users are familiar with, and has added several new ones. Many 5.x users took advantage of external utilities such as Taporder to manage message threads, and Tappet to provide intelligent message-header marking. Taporder and Tappet have been integrated into Tapcis 6.0. You can now download only the headers from a forum, sign off, mark the messages you want to read, and download them the next time you're on-line.

Tapcis 6.0 automatically indexes and threads messages, and lets you create a variety of custom views. For example, you can read all the messages you've downloaded, only the new ones, or only those addressed to you.

Current Tapcis users will definitely want to upgrade to Version 6.0. The money saved by working off-line will more than offset the cost of buying and learning the program.



NEW FACE: Tapcis 6.0's new interface features drop-down menus and easier CompuServe navigation.

Tapcis 6.0. List price: \$39.50. Requires: 512K RAM, DOS 3.1 or later, EMS or XMS to handle larger message files. The Support Group Inc., McHenry, MD; 800-872-4768, 301-387-4500.

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January 1995**

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*In Canada, call 1-800-487-8967. *Average U.S. street price. Monitor not included. Source: 1994 J.D. Power and Associates Desktop PC Customer Satisfaction Study. **Study conducted among business second and third year return-to-dealer. MS-DOS is a U.S. registered trademark and Windows is a U.S. trademark of Microsoft Corporation. Pentium and the Intel Inside logo are U.S. registered trademarks.

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In addition, HP ranked best overall among desktop PC business users in the 1994 J.D. Power and Associates Customer Satisfaction Study.¹

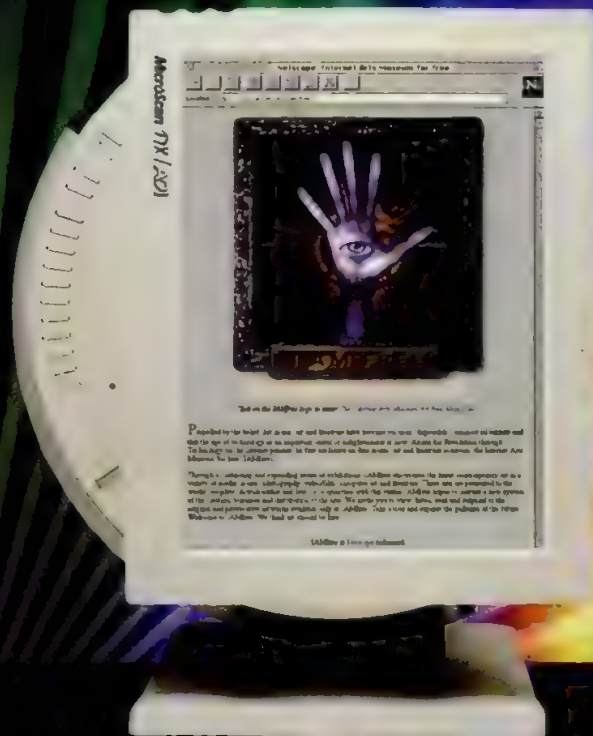
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Surfing the Internet just took a turn for the better.

View Oversized Documents Without Scrolling

The ADI MicroScan™ 17X monitor puts a whole new spin on the way you work. In seconds, it can

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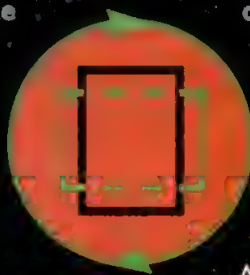
Just click on the portrait driver icon, turn the monitor, and hit the degauss button on the front-panel. It's that easy to flip between Internet home pages, word processors, oversized spreadsheets, and other applications—and still get the big picture.

Larger Viewing Area In Its Class

The MicroScan 17X is like getting a 21" display for the price of a 17" monitor. Its vertical viewing area in portrait mode is larger than any 17" or even 21" monitor on the market, and easily accommodates an entire 8.5" x 11" legal or A4 page in portrait view. No need to scroll or print to see the whole page. This means you'll be able to do twice as much in half the time.

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The MicroScan 17X also has many other things to flip over. Like a 17" CRT display with a 16" diagonal viewing area, 1024 x 768 resolution, flicker-free 76Hz performance, .28mm dot pitch, microprocessor digital controls, even Plug-n-Play compatibility. It's a feature set you won't find in competitively priced monitors. And since ADI builds monitors for leading PC companies worldwide, you know you're making a quality investment for the long haul. The MicroScan 17X is also backed by a three-year warranty. Best of all, you don't have to be a Web Master to get one. Just call 1-800-228-0530 for your nearest dealer.



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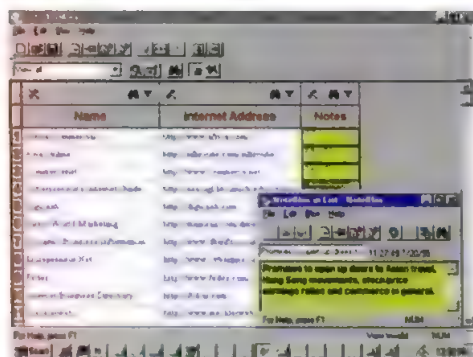
New & Improved

NEWS OF ANNOUNCED PRODUCTS AND UPGRADES

By Melissa J. Perenson

AlphaBlox's Application Building Blocks

AlphaBlox's \$69.95 software package, OfficeBlox, is the first release in a planned series of add-ons that will expand your system's functionality under Microsoft Windows 95. OfficeBlox is based on a modular component scheme that con-



IT'S ALL IN THE BLOX: ListBlox lets you keep detailed lists by interacting with NoteBlox.

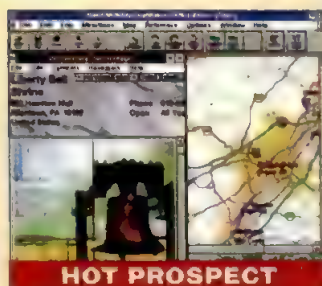
sists of five miniapplications designed to work in tandem with any other programs or as standalone items that may be embedded within one another as customized productivity enhancers. OfficeBlox includes NoteBlox, which are electronic sticky-notes; CalcBlox, an enhanced calculator with templates for such specific calculations as straight-line depreciation; ListBlox, a tool for creating lists that supports ODBC database queries; and WorkBlox, an OLE container that serves as a visual organizer for files and other Blox.

OfficeBlox. List price: \$69.95. AlphaBlox Inc., Burlington, MA; 800-227-2569, 617-229-2924; fax, 617-272-4876.

Circle 408 on reader service card

Video En Suite

Two video-editing packages from Gold Disk address opposite ends of the consumer spectrum. The \$100 VideoDirector Suite 2.5 for Windows lets you control a camcorder and VCR from your PC to create your own custom-edited home videos, right down to the labels for your tapes. The suite builds on its predecessor, VideoDirector 2.0, and adds title, animation, and sound-editing capabilities, as well as a clip-media CD-ROM. Beginners who don't need all the trimmings found in the suite may opt for the \$50 VideoDirector Home for Windows. The Home version includes everything you need to connect your com-



Plan a Getaway in Style

Rand McNally New Media's \$40 TripMaker 1996 Edition is like having a travel agent at your desktop. It's now a whole lot easier to alter your itinerary and explore options while planning everything from the perfect weekend getaway to a cross-country trip.

TripMaker leverages Rand McNally's established cartographic content to create a comprehensive multimedia atlas. The 1996 version has improved the interface so that the maps you view on-screen provide an almost seamless transition from the familiar look and feel of traditional paper maps. The detail and accuracy of the maps has been improved, and road segments have been upgraded to reflect recent construction.

The maps cover all of North America and include 200 city insets. You can calculate the most efficient route based on such preferences as departure time, stopover durations, and whether you want the most direct or scenic route. Planning a trip is made even easier by TripMaker's tour guide, which prompts you to input your travel plans and helps you create an itinerary.

The real strength of TripMaker is in its descriptions of tourist destinations. There are unique panoramic views of 30 cities, tourism videos, and a restaurant and hotel guide that links to the appropriate maps.

StreetAtlas, a two-CD \$50 companion product that's integrated with TripMaker, lets you locate any street in the U.S. You can search by either an address or ZIP code, and then print out directions.

TripMaker 1996 Edition. Estimated street price: \$40. Rand McNally New Media, Skokie, IL; 800-671-5006, 708-329-8100; fax, 708-329-6335.

Circle 406 on reader service card

ponents into a video-editing system as well as a more simplified graphical interface that draws on the familiar camcorder and VCR button controls. **VideoDirector Suite 2.5 for Windows.** Estimated street price: \$100. **VideoDirector Home for Windows.** Estimated street price: \$50. Gold Disk Inc., Santa Clara, CA; 800-982-9888, 408-982-0200; fax, 408-982-0298.

Circle 412 on reader service card

Streets+ Phones = Power

If Rand McNally's TripMaker 1996 Edition is slanted more toward vacation planners, DeLorme Mapping's \$80 Street Atlas USA 3.0 is all business. Street Atlas features updated maps covering all 50 states; the level of detail has been vastly improved since the last incarnation. Street Atlas offers latitude and longitude data and improved color differentiation. New to this 32-bit version are a powerful search engine that lets you locate a specific address and ZIP code on the map, and a set of map-customization tools, which allows you to create your own maps that can be annotated and edited as needed. An attractive \$80 add-on is Phone Search USA, a CD-ROM national phone book containing over 80 million residential and



STREET POWER: Street Atlas USA 3.0 provides all sorts of detailed maps.

business numbers that is fully integrated with Street Atlas, so that you can locate a phone number on Phone Search on the Street Atlas map. **Street Atlas USA 3.0.** Estimated street price: \$80. DeLorme Mapping, Freeport, ME; 800-452-5931, ext. 102, 207-865-4171; fax, 207-865-9291.

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Digital Snapshots

Ritz Camera's \$1,000 Dakota Digital DCC 9500 3X zoom camera has the potential to open up the world of digital photography to a wider audience.

New & Improved

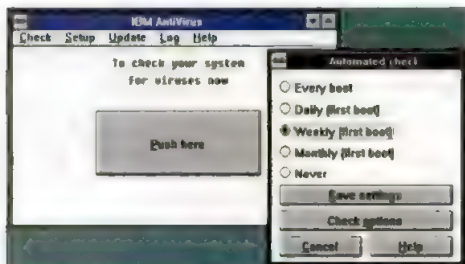
The camera, distributed by a nationwide photo retailer, Ritz, weighs just 18.4 oz and handles like a hybrid point-and-shoot 35-mm camera and a camcorder. Twenty-four-bit images are captured at up to 640-by-480. The images are stored in the 1MB of on-board flash memory on 2MB to 16MB flash-memory PC Cards. Upload the images to your PC using the included serial cable, software utility, or Twain driver. There's a built-in electronic flash and flexible manual and auto-focus controls. A 3:1 power zoom lens has a focal length the equivalent of a 38-114-mm zoom lens on a single-lens reflex camera.

Ritz Dakota Digital DCC 9500. Estimated street price: \$1,000. Ritz Camera Centers Inc., Beltsville, MD; 800-523-6287, 301-419-0000; fax, 301-419-2995. Circle 410 on reader service card

Protect Your System's Integrity Against Viruses

To protect your system from increasingly insidious viruses, IBM's acclaimed \$49 IBM AntiVirus 2.0 Desktop Edition is now available to consumers. Although this product doesn't win any points for being pretty, the simple, unencumbered software can automatically scan disks to alert you before a virus is transferred to your PC. If a virus is identified from amongst IBM's database of over 6,000 virus strains, the program will either disinfect the affected media or replace an unrecoverable boot record with an uninfected one. The Desktop Edition runs on DOS, Microsoft Windows 3.1, and OS/2 Warp.

On the Microsoft Windows 95 side is McAfee's \$65 VirusScan for Windows 95. The sleek software uses the Windows 95 Explorer to blend in with the Windows 95 operating system. McAfee has also upgraded its Windows 3.1 and Microsoft



PLAIN, BUT POWERFUL: IBM AntiVirus 2.0 Desktop Edition gets the job done.

Windows NT versions of this product. McAfee includes two years of free updates.

IBM AntiVirus 2.0 Desktop Edition. List price: \$49. IBM Corp., Sterling Forest, NY; 800-742-2493, 914-759-4635.

Circle 413 on reader service card

VirusScan for Windows 95. List price: \$65. McAfee, Santa Clara, CA; 800-332-9966, 408-988-3832; fax, 408-970-9727.

Circle 414 on reader service card

HARDWARE BRIEFS

So many telecommunications devices, so few dedicated phone lines to go around. It's a dilemma faced by many a home and small office these days. MAXShare, from MAXBase, is an innovative way to help mitigate the problem. This \$349 phone-sharing device is essentially a giant signal splitter capable of doubling the number of devices you can connect to a line. MAXShare lets you input up to four phone lines into its slimline box and then share those lines among eight devices. Safeguards prevent more than one device from using the same line simultaneously. 800-631-1121, 201-836-6300.

Your VCR isn't obsolete yet, but Visionetics International's MPEG capture and playback card, MPEG Master PRO, advances the PC's video functionality another big step. This \$349 card provides full-motion, 30-frames-per-second video, as well as CD-quality stereo sound. And since there's scalable MPEG output for both VGA and NTSC/PAL monitors, you can view your PC's video output on a TV or video monitor. A TV tuner and infrared remote control are optional. 310-316-7940.

Don't fret if you bought a notebook that lacks built-in sound—a noticeable omission now that you want to add an external CD-ROM drive. EXP Computer has added 16-bit stereo sound to its portable PCMCIA CD-ROM drive. The \$485 EXP CDS-940 is a double-speed model that connects via a Type I PC Card; its built-in SoundNote module adds a speaker, a microphone, a volume control, and line-in and line-out jacks. The drive weighs 2.8 pounds and draws its power from your notebook—without draining the notebook's own power source. 800-397-6922, 714-453-1020.

Quantex Microsystems is offering a value-conscious deal on a 133-MHz Pentium mini-tower system. The \$3,149 QPS/133 SM-1 comes with 16MB of RAM, a 1.28GB hard disk, a Toshiba quad-speed CD-ROM drive, a 16-bit Ensoniq wavetable sound card, a 64-bit video accelerator card with 2MB of DRAM, a pair of Altec Lansing speakers, a 28.8-Kbps V.34 modem, and a 17-inch MAG monitor. 800-787-8686, 908-563-4166.

American Power Conversion is ready for Windows 95 with its plug-and-play Back-UPS Pro Workstation Bundle. The units, which start at \$239, are optimized for use with multitasking systems, and there's software support for OS/2, Windows for Workgroups, Windows 95, and Windows NT. 800-800-4272, 401-789-5735.

You've Got My Number

Rochelle Communications' \$299 Caller Profile series is a logical bridge between your telephone and your PC. This two-line caller-display unit capitalizes on the forthcoming nationwide deployment of Caller ID service and goes beyond traditional phone-company Caller ID units. With national Caller ID service, the unit will not only show the number of the incoming caller but will also identify the caller's name (if your local service supports this feature), city, and state. The unit keeps a convenient phone-log record of incoming and outgoing calls and has a



CALLTRACKER: Caller Profile gives you Caller ID and more.

handy stopwatch that can be used for monitoring call lengths.

Caller Profile connects to your PC via the serial port and is fully integrated with the bundled Starfish Corp.'s Sidekick personal information manager. Rochelle also offers 1-, 6-, and 12-line units.

Caller Profile Two-Line Display with Sidekick. List price: \$299. Rochelle Communications Inc., Austin, TX; 800-542-8808, 512-339-8188; fax, 512-339-1299.

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NaviPress Removes Web Publishing's Barriers

Calling all you aspiring, do-it-yourself World-Wide Web home-page authors: NaviSoft's \$99 NaviPress 1.01 is an easy-to-use combination authoring and browsing tool that lets you create and edit Web pages without having any knowledge of the arcane HTML. Creating links is a snap: You simply copy a URL from one location and paste it in another. You create pages while in the browser, so you get an accurate preview of how the pages will appear on the Web. Everything here is visually represented. The browser, which is equipped with the usual functionality, provides a streamlined interface and comfortable working environment for both novice and professional Web-page creators. NaviPress is just half of NaviSoft's client-server solution for publishing home Web pages; NaviServer lets you establish and maintain a presence on the Web.

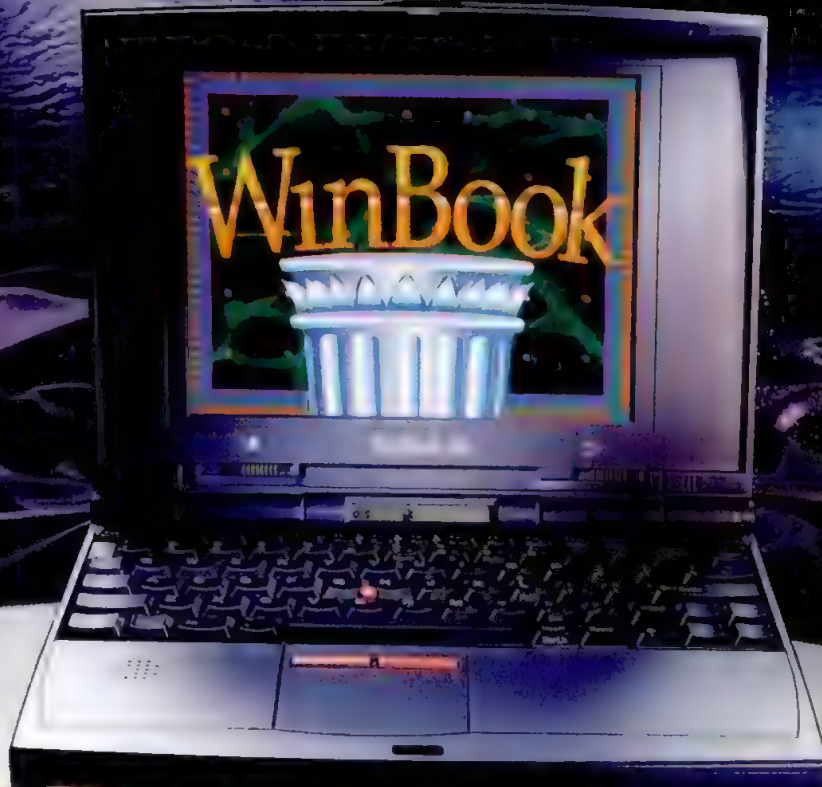
NaviPress 1.01. List price: \$99. NaviSoft Inc., 800-879-6882, 703-918-2329.

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Organizing Your Finances

Intuit bolsters its line of personal and small-business finance software with the \$50 Quicken ExpensAble for Windows and the \$190 QuickBooks Pro for Windows. Quicken ExpensAble, which is

17 Awards and Counting...



- 1 PC World — Best Buy — May 1995 WinBook XP
\$279.99/\$399.99
- 2 PC World — Best Buy — June 1995 WinBook XP
\$279.99/\$399.99
- 3 PC World — Best Buy — July 1995 WinBook XP
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- 4 PC World — Best Buy — August 1995 WinBook XP
\$279.99/\$399.99
- 5 PC Magazine — Editors' Choice — August 1994 WinBook XP
\$279.99/\$399.99
- 6 PC Laptop — Editors' Choice — Most Improved Portable
January 1995 WinBook XP
- 7 PC World — Best Buy — February 1995 WinBook XP
\$279.99/\$399.99
- 8 PC World — Best Buy — March 1995 WinBook XP
\$279.99/\$399.99
- 9 PC World — Best Buy — April 1995 WinBook XP
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- 10 PC World — Best Buy — May 1995 WinBook XP
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- 11 PC World — Best Buy — July 1995 WinBook XP
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- 12 PC World — Best Buy — August 1995 WinBook XP
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- 13 Laptop Buyer's Guide — Best Buy — July 1995 WinBook XP
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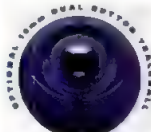
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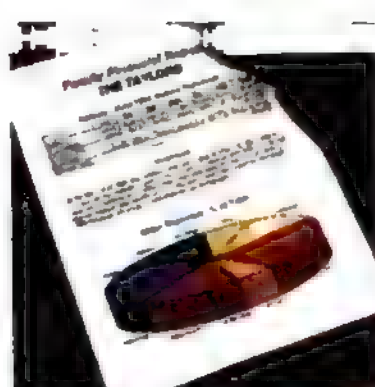
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Quicken ExpensAble for Windows. *Estimated street price: \$50. QuickBooks Pro for Windows.* *Estimated street price: \$190. Intuit Inc., Menlo Park, CA; 800-816-8025, 520-295-3000; fax, 800-765-3740. Circle 415 on reader service card*

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Enjoy the convenience of using a Microsoft Windows 95-specific keyboard with one of these two new offerings from leading keyboard vendors. **Mitsumi Electronics Corp.'s** \$34.95 ZW 104 in-



SHORTCUTS: Mitsumi's sleek keyboard includes three Microsoft Windows 95 keys.

cludes three Windows 95-specific keys that will help you speedily launch and navigate applications within Windows 95. The tactile keyboard has been subtly redesigned for a sleeker look and ergonomically adjusted key positions. **NMB's** \$50 RT-6600WIN similarly features a tactile touch and three Windows 95 keys.

Mitsumi ZW 104. *List price: \$34.95. Mitsumi Electronics Corp., Irving, TX; 800-648-7864, 214-550-7300; fax, 214-55-7424.*

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NMB RT-6600WIN. *Estimated street price: \$50. NMB Technologies Inc., Chatsworth, CA; 800-662-8321, 818-341-3355.*

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You can hear it already—a collective sigh coming from users making the transition to Microsoft Windows 95: "Here we go again, starting from scratch. . ." Several tutorials are helping smooth the bumpy learning curve that lies ahead.

CRT Multimedia's \$40 EasyTutor Learn Win-

SOFTWARE BRIEFS

Companies are finding themselves hard-pressed to keep employees from accessing World-Wide Web sites that are not related to business. **WebTrack**, from **Webster Network Strategies**, provides a \$7,500 software solution to monitoring and controlling Web access. The software, which installs on a proxy server either behind the network's firewall or on the network's firewall, can restrict access to up to 15 categories of Internet sites. 941-261-5503.

TeamFlow 4 for Networks, from **CFM**, provides flowcharting, organizational charting, cost and schedule tracking, and Gantt charting in a single application that's designed to maximize the potential of project management workgroups. A five-user license costs \$1,150. 800-647-1708, fax, 617-275-7008.

For a one-step immersion into the world of on-line access, pick up a copy of **CD-ROM Wholesale's** Internet Plus. A \$50 CD-ROM that provides free trial subscriptions to such on-line services and Internet providers as CompuServe, Netcom, and Prodigy, the package also features a World-Wide Web directory, Internet video tutorials, and Internet tools such as Eudora and NCSA Mosaic. 800-801-7513.

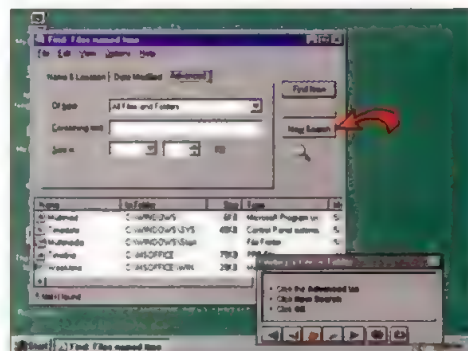
The \$795 **DB/TextWorks**, from **Inmagic**, combines the functionality of a database with the ease and efficiency of text-retrieval products. **DB/TextWorks** is designed as a text DBMS, so it includes variable-length and repeating fields, as well as linked textbases to eliminate duplication of data. Network licenses start at \$2,900 for five users. 800-229-8398, 617-938-4442.

Byte by Byte's SoftFX, Version 2.5, is a 32-bit animation, 3-D-modeling, and photorealistic-rendering program designed for Windows 95, Windows NT, and Windows 3.1. The \$695 package now has enhanced Bezier drawing and OpenGL support, which increases the redraw speeds of 3-D animations when previewed in real time. 512-305-0360.

Information Access Company's IntelliSeek: The Ultimate Business Resource is a \$1,500 CD-ROM that presents information in a coherent manner. IAC (formerly known as Computer Library) packs this disk with citations, abstracts, and full-text articles from over 400 leading business periodicals over the past 12 months. The improved Windows interface makes it a breeze to search the disk. Computer Select, a comparable resource for the computer industry, is also available. 800-419-0313.

Windows 95 is a novice-friendly CD-ROM that walks you step by step through Windows 95's interface and lets you learn at your own pace through automated demonstrations. If your brain is stuck in Microsoft Windows 3.1 mode, you can compare Windows 95's features with the Windows 3.1 equivalents.

Microsoft Press is offering two interactive CD-ROMs designed to familiarize you with Windows 95. The \$39.95 **Microsoft Windows 95 Starts Here** includes a structured 3-hour course that can be tailored to your needs. The \$19.95 **Microsoft Windows 95 How & Why** brings Herb the Help Desk Guy right to your desktop; he then takes you through the most basic or advanced of tasks.



LEARN AS YOU GO: The **Windows 95 Complete Training** overlays tutorials on your desktop.

There's also a guided tour of Windows 95 and excerpts from three Microsoft Press books.

If your sense of humor needs a lift after installing Windows 95, then try out **Graphix Zone's** \$39.95 **The Improv Presents Windows 95 For The Technically Challenged**. Although it focuses on Windows 95, this CD-ROM also includes a general guide to computers. Everything is presented in the atmosphere of a virtual Improv comedy club, which is enlivened by real Improv comedians.

Soft-One Corp. offers **The Windows 95 Complete Training**, a \$95.95 supplement to the company's **ClassAct** line of simulation training aids. The CD-ROM provides an organized, interactive tutorial that takes you through Windows 95.

EasyTutor Learn Windows 95. *Estimated street price: \$40. CRT Multimedia Ltd., London, England; fax, 011-44-181-740-0020; e-mail, crt@crtmm.demon.co.uk.*

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Microsoft Windows 95 Starts Here. *List price: \$39.95. Microsoft Windows How & Why.* *List price: \$19.95. Microsoft Press, Redmond, WA; 800-677-7377, 206-882-8080.*

Circle 424 on reader service card

The Improv Presents Windows 95 For The Technically Challenged. *List price: \$39.95. Graphix Zone Inc., Irvine, CA; 800-828-3838, 714-833-3838; fax, 714-833-3990.*

Circle 425 on reader service card

The Windows 95 Complete Training. *List price: \$95.95. Soft-One Corp., Orem, UT; 800-235-3276.*

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PC Magazine, September 26, 1995

For starters, behind the new ergonomically-designed case featuring easy front access to all video and audio outputs and controls, is pure horsepower that makes the new Windows 95™ experience truly complete. And if being the fastest isn't enough, check out the MediaStar's

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Edited by Tin Albano

Beating the SCSI Blues

BY DANIEL GROTTA AND SALLY WIENER GROTTA

If you're prepared to put up with the extra cost and almost guaranteed frustration, the payoff in using SCSI rather than IDE and Enhanced IDE (E-IDE) is better performance and greater versatility. SCSI can move data much faster than IDE or E-IDE, an important prerequisite for serious multimedia and graphics applications.

Peter M. Ridge's *The Book of SCSI* is a welcome, long-overdue guide to successfully navigating

through SCSI's many intricacies and vagaries. Ridge has assembled a first-class team of SCSI experts to analyze and explain almost everything there is to know about SCSI. What is remarkable is that they manage to do it in a simple, readable style that can be easily understood by the nontechnical reader. They do this by carefully dissecting exactly what SCSI is, how it works, and why it presents so many problems.

The Book of SCSI provides a wealth of detailed information; the reader will learn just about

everything there is to know about SCSI. More importantly, it takes the reader in hand as it wades through making a successful installation, pinpointing and solving problems, tapping into SCSI's cross-platform capabilities, and selecting and matching cables and connectors with the proper devices.

Just as useful as the general and specific information on making SCSI work is the volume of reference and source material. Half the book is devoted to drawings, schematics, and data describing most commands, signal and error

codes, drivers, cables, and much more. It even gives descriptions and comparisons of most SCSI controllers, as well as the company names and phone numbers.

Last but certainly not least are several useful Q & A sessions and Internet and bulletin board addresses for further information and help.

The Book of SCSI is a must-buy for everyone who wrestles with

this touchiest of technologies.

The Book of SCSI, by Peter M. Ridge, \$34.95. No Starch Press, 800-420-7240; ISBN: 1-886411-02-6.

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Making Homework Fun for Kids

BY CHARLES TAFT

How many parents have bought multimedia computers for their children in the hope that homework will become more productive and the children themselves will be academically enriched, only to find that the computer is really being used as an electronic baby-sitter or an Awesome SuperMega Game Machine? Authors Diane Kendall and Jim Lengel, both of whom have impressive academic credentials and an abundance of common sense, have written *Kids, Computers & Homework*, a 356-page guidebook that helps you transform your family's computer into an academic dream machine.

Kids, Computers & Homework is comprehensive, clearly

written, and strategically illustrated. The book is divided into five parts: "Author, Arthur!" helps children learn to brainstorm, get their ideas on paper, and then work with the text and graphics to produce a unique product. "Becoming a Knowledge Navigator" explores the many uses of reference CD-ROMs for the home and explains the resources of on-line services and the World-Wide Web.

"It's Multimedia Showtime!" shows kids how to enrich their written words with digital images, slide shows, videos, sound, and animation—some of it much less expensively than you'd think possible. "You Won't Know Unless You Experiment" explains the use of simulation programs, such as SimTown and Oregon Trail, to

explore real-world concepts, and it offers suggestions for using music programs to enable children to create their own compositions. And "Relief for Everyday Homework Headaches" gives parents and kids tips on finding and using software that's interesting as well as instructive. Three appendixes—a sampler of Internet sources, a listing of software mentioned in the book, and information on contacting the software developers—complete the book.

This book offers kids a comprehensive plan to conceptualize, construct, and complete meaningful homework assignments on their own. The authors give young computerists a multi-

tude of examples and suggestions and then let them reach to create their own individual works.

Although the book certainly offers many practical examples for using its suggestions, the primary strength of *Kids, Computers & Homework* is that it helps children learn and implement the processes needed to create their own presentations and projects, processes they will ultimately use throughout their lives.

Kids, Computers & Homework, by Diane Kendall and Jim Lengel, \$16.00. Random House Electronic Publishing, 800-793-2665; ISBN: 0-679-76007-5.

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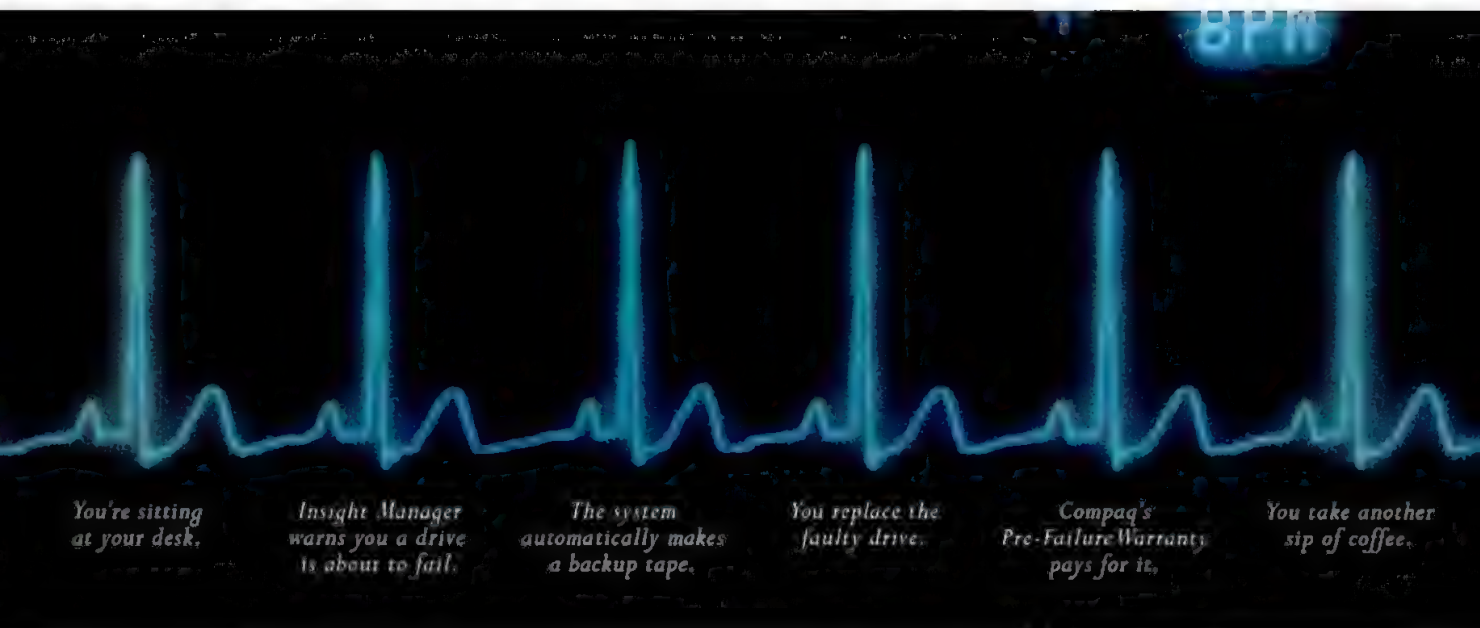


and why they do. \$40.00; Adobe Press, 800-428-5331; ISBN: 1-56830-221-5.

Ray Kristof and Amy Satran's *Interactivity by Design* deals with new media publishing not from a "how-to" technological standpoint but from a more holistic perspective.

The goal of this book is to investigate which interactive products work well together,

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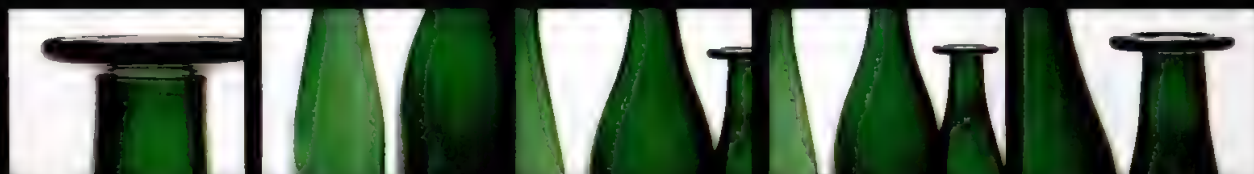
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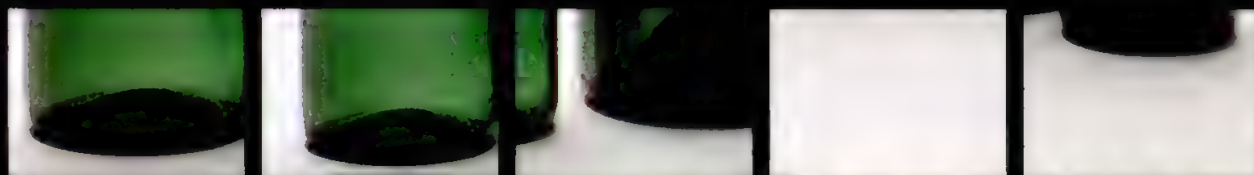
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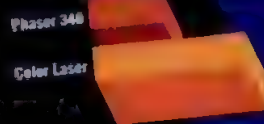
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Michael J. Miller

Beyond Windows 95

All the hoopla surrounding Microsoft's rollout of Windows 95 this past August might lead you to believe that this is the last operating system you'll ever need. Well, it isn't. Windows 95 is just another step in the evolution of the PC. There is one thing

you can be sure of: The way we work with, live with, and think about our computers will continue to change.

What exactly is an operating system? It isn't an easy question to answer, because the definition is changing as we move into a world defined as much by the connections between computers as by personal or even LAN-based applications. Microsoft clearly understands this and is already well down the road toward creating the next versions of its Windows operating systems. Apple and IBM are sure to follow suit.

For Windows 95, the next step will be a series of "service packs" that Microsoft plans to issue quarterly. In addition to fixing minor bugs, which are inevitable in any large program, these packs will include new components and drivers. According to Brad Silverberg, vice president and general manager of Microsoft's personal operating systems division, these updates will be available for free downloading on a number of on-line sites, to corporate customers with maintenance agreements, and on-disk for a nominal fee.

The first Windows 95 service pack, which we can expect to see sometime in October or November, will feature a revised version of Internet Explorer, Microsoft's Web browser. The revised version will include support for HTML 3.0 and tables (the new Internet Explorer will also be available for downloading separately). Silverberg said that he expects that the first Windows 95 service pack will also include a new NetWare client that will take advantage of new features such as Novell's NetWare Directory Services, a 3,270-stack protocol manager, and device drivers for such features as infrared connections. One of the future Windows 95 service packs is scheduled to include imaging support.

NASHVILLE DREAMING

Let's look a little further down the road at "Nashville," the next version of Windows 95. Having guessed wrong the last time, Microsoft won't commit to a release date for this operating system, but it should be available toward the end of next year. Can you say Windows 96? No? Well, how about Windows 97? Don't expect this version to represent as big a change as there was between Windows 3.1 and Windows 95. Silverberg told me that Microsoft plans to alternate major and minor releases, with Nashville scheduled as a relatively minor release.

While Microsoft won't commit to any features now, Silverberg will confirm four major directions for the mainstream operating system. Perhaps most important, Windows will get a lot more Internet connectivity features beyond a significantly enhanced browser. "Integrating the Internet into every aspect of the OS is a key initiative going forward," Silverberg says. Microsoft is also focusing on higher-bandwidth communications, designed to take advantage of the many new communications devices gaining in popularity, such as ISDN connections.

Another focus is on significant new multimedia components. Some components, such as Direct Draw and Direct Play APIs, will ship earlier in the Game Software Developers Kit, so you can expect to get games sometime later this year that will incorporate these features. Other features, including software MPEG playback, are due to be included in service packs.

Other areas of focus will include hardware innovations, such as new bus architectures, support for the Universal Serial Bus, and an "instant on" feature.

After Nashville, the next major release of Windows is code-named "Memphis."



*Over time, the operating system
will evolve to become
a window on the Internet.*

Michael J. Miller

Microsoft isn't publicly discussing Memphis, except to deny strongly some published reports claiming it is designed to be a 64-bit operating system.

HEADING TOWARD CAIRO

In the meantime, Windows NT is going through its own evolution. By the first half of next year, everyone expects the next version of Windows NT to ship, which will include the Windows 95 shell and support for other Windows 95 elements, such as TAPI. This will give Windows NT the look of Windows 95, as well as support for almost all the programs being developed for it. This facelift may be a "minor" release, but it just might make Windows NT more mainstream.

With all of the "Win32" applications that will be out by then, I expect Windows NT will be compelling to a lot of large companies because it's more stable, more secure, and better suited for mission-critical applications. It won't matter to some of these companies that NT requires more hardware, is less com-

patible with older applications, and doesn't currently support features like Plug and Play or power management. The primary reason companies are going to buy Windows NT is because it's more robust.

Up next is "Cairo," the next big release of Windows NT, slated to go into beta testing toward the end of next year, meaning it might ship sometime in 1997.

Cairo focuses on enterprise users, with advanced features including the long-awaited object file system and distributed objects. Don't expect Cairo to have an entirely new interface. In Microsoft's scheme, NT will continue to push the architecture, but the primary user-interface changes will be left to the more mainstream versions of Windows.

Eventually, expect a future version of Windows to use the underlying kernel from NT. But even that won't be the last mainstream operating system. Microsoft CEO Bill Gates says he sees a need for three operating systems: one for the high end where new technology can be introduced, as it has been in NT; one for the mainstream PC (such as Windows); and one for devices with limited hardware, such as personal digital assistants or set-top boxes. ("Microsoft TV," a demonstration product for interactive tele-

vision, shows set-top boxes connected to an NT-based series of machines.)

Of course, Microsoft's competitors aren't standing still. Apple is readying a new release of the Macintosh operating system called "Copland," due out next year. It will have user-interface improvements, more multimedia enhancements, and a shell that allows for multitasking. Copland will be followed by a true multitasking operating system called "Gershwin."

IBM is readying a microkernel-based version of its OS/2 operating system, first for the Power PC, due later this year, and later for Intel-based machines. IBM seems to be positioning OS/2 Warp more for enterprise clients these days. We should expect to see IBM's Warp Server later this year, and both IBM and Apple will support Taligent's object-oriented CommonPoint frameworks, in addition to the OpenDoc specification for compound documents.

As I've been saying for some time, operating systems will continue to change because the Internet is becoming a platform for software development. Even Microsoft is finally getting that message. Says Silverberg, "Over time, the operating system will evolve to become a window on the Internet." □

GUIDE TO ELECTRONIC EDITIONS

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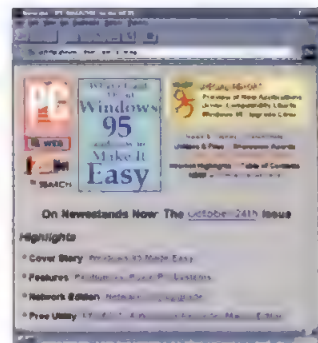
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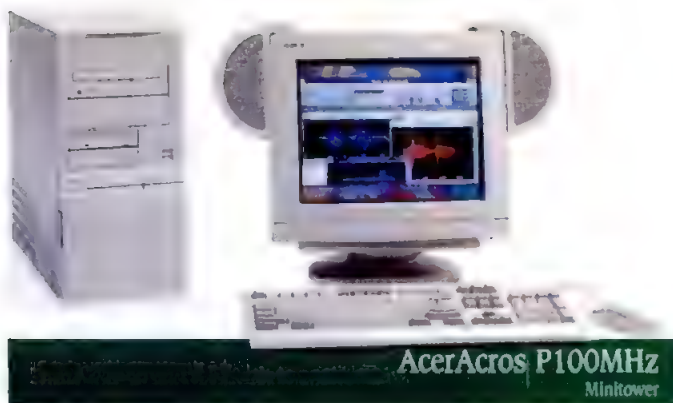


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PC Magazine - Sept. 12, 1995, on the SyncMaster 17GLi and 17GLSi monitors.



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CIRCLE 046 ON READER SERVICE CARD





Bill Machrone

Needed: A Digital Weatherman

Bob Dylan galvanized a generation with the phrase, "You don't need a weatherman to see which way the wind blows." But we sure could use one now, because the future of digital telecommunications is so murky that it's impossible to plan. Half a dozen

existing and developing technologies promise us a Nirvana of connectivity. If only it were as easy as their proponents claim.

Analog modems have hit the wall in line speeds. There's maybe one more tweak after 28.8 Kbps, and it won't be that much faster. ISDN is expensive, relatively unavailable, and if the truth be told, isn't breathtakingly fast. It's hard, for instance, to find an Internet service provider that offers bridged, 128-Kbps access. Besides, many 64-Kbps connections actually run at 57 Kbps. It's a mess. After all, it was designed for voice, 20 years ago.

Cable modems are fast at 10 megabits per second, but the vast majority of the cable infrastructure is unidirectional. The amplifiers that move the TV signals (and data) along from the head end to your home can't pass signals in the opposite direction. The whole system has to be rebuilt. Also, most businesses aren't wired for cable, and they probably never will be. Asymmetrical systems (phone out, satellite in) are very fast, with a maximum bandwidth around 40 Mbps and an effective data rate of around 1 Mbps, but the number of digital satellites and transponder channels is limited. It's a great technology demo, but nobody can afford it.

The goal is to augment and replace copper wire for more mobile telephony products and services. Data connections from notebooks are a big part of the plan, but personal communications services are likely to be too expensive for data surfing from home. Fiber to the home? Sure, if you're lucky enough to live in a test city.

Into this mess comes ADSL (Asymmetric Digital Subscriber Line), originally the telephone companies' answer to interactive TV. Since nobody (beyond the maniacs on the Sega channel) cares a fig for ITV, it's being recast as the answer to fast Internet access. You send data at 64 Kbps but

receive at anywhere from 1.5 Mbps to 6 Mbps—over existing copper wire.

ADSL can deliver high-fidelity audio and MPEG movies at these rates, and even the most complex Web pages will just pop onto the screen. Business apps such as remote LAN operations, videoconferencing, and "digital dial tone" will benefit enormously and will ultimately create a demand for an all-fiber communications system.

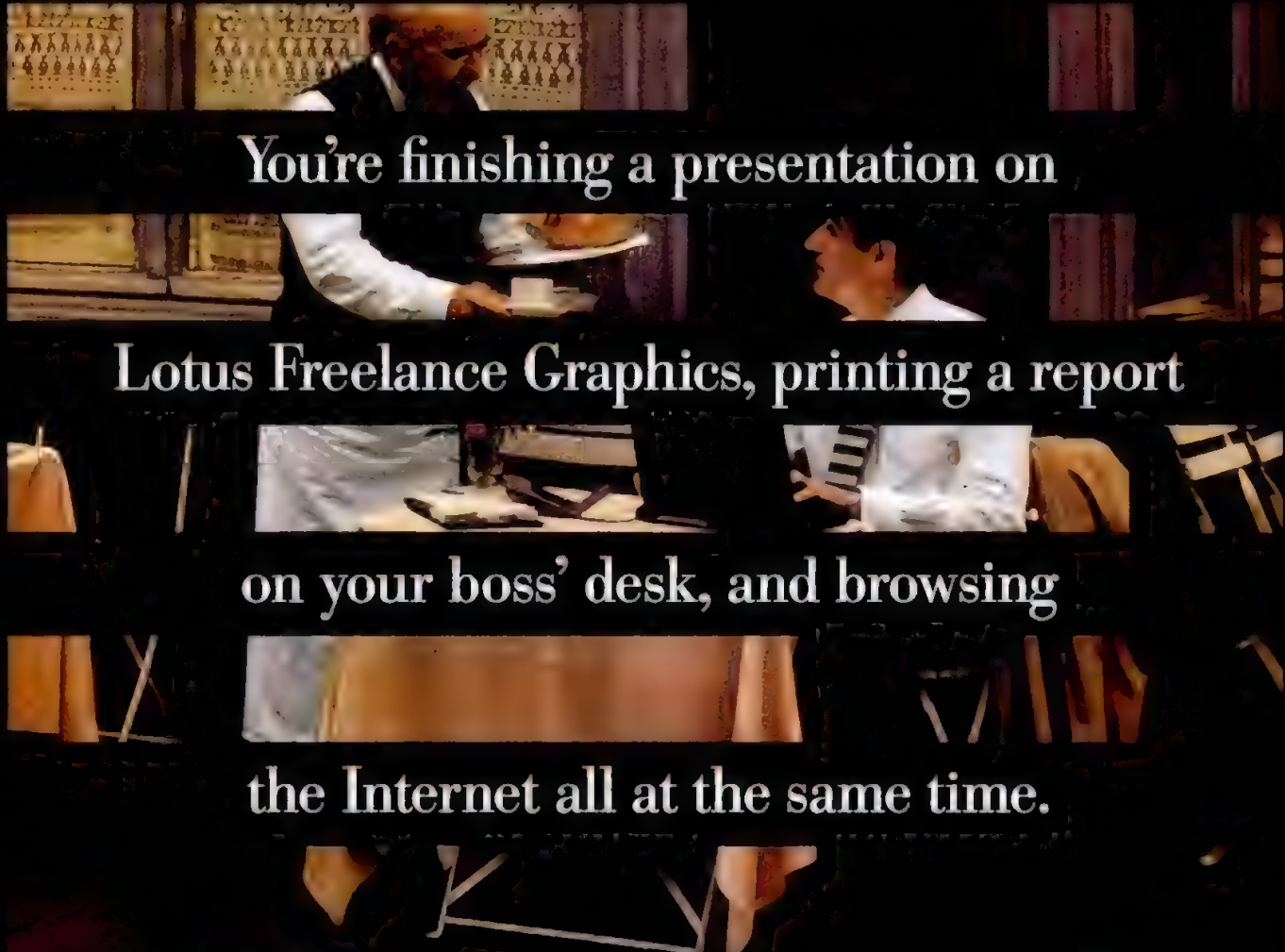
ADSL performs its magic in one of two competing ways. DMT (digital multi-tone) divides the bandwidth of the copper wire into small segments and modulates each segment with highly compressed, encoded, and error-corrected signals. CAP (carrierless amplitude and phase modulation) is an equally complex method developed by AT&T. You wind up with ADSL modems on each end of the wire, but ADSL is a short-haul solution limited to a couple of miles. So your local telephone company begins to resemble a service bureau, with a bank of ADSL modems to answer your call and switch data to and from a high-speed backbone network. (Ultimately, ADSL will be built into the subscriber line cards in the central office.)

It's no secret that the telcos have been grumpy about the money that Internet service providers are making using the telcos' networks. ADSL gives telcos an excellent, unassailable entry, since modems have to be on their turf.

One of the key players in ADSL, Aware Inc., has partnered with chip vendor Analog Devices to produce a chip set for ADSL modems by early spring. They'll be expensive at first but will quickly coast down to \$250 to \$300. Other vendors, such as AT&T Paradyne, have announced products. The competition between DMT and CAP shouldn't affect you, since you'll simply buy a modem compatible with the ones at your central office. □



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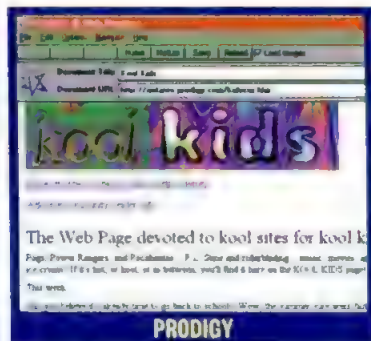
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Second Looks

LIVING WITH THE PRODUCTS WE REVIEW



Getting to the Internet Isn't Always Easy

Our readers have been using on-line services for years, so it's natural that they would try the Internet access packages of the major service providers—America Online, CompuServe, and Prodigy. Interestingly, most of the readers I've heard from have tried at least two on-line service providers; some have tried them all. The World-Wide Web is a tantalizing place to be, but getting there is less than half the fun.

CompuServe has the biggest network, with the best overall performance. But its dialer and Web browser, from Spry, are generally regarded as the least capable. Connecting to the Internet requires breaking your normal connection and redialing through the Spry dialer. Spry's socket services are inhospitable to non-Spry browsers, and the install program rudely overwrites any other socket services you might have on your system.

Given the Web user's predilection for trying a variety of browsers, this is the worst way to go. CompuServe's Usenet connection has experienced a lot of downtime, but the available newsgroup reader is so

bad, it's a wonder that anyone uses it at all.

I found that people who hadn't had much experience with the Internet, or more specifically the World-Wide Web, were the only users pleased with Prodigy's Web access capabilities. They crowed about how easy Prodigy's Web access was to use, while at the same time complaining about the limited amount of options the on-line service provided. Overall, Prodigy users were generally not satisfied with network performance.

Of the three major on-line services, America Online has gotten the most abuse, for everything from poor network performance to billing errors. AOL is exhibiting all the signs of a company that's growing so fast it can barely keep up with itself, a good problem to have, but wearisome for its customers. On the plus side, AOL has the most seamless integration of its existing services and the World-Wide Web.

More demanding users point out some other flaws: "None of the on-line services' Internet products is capable of using a modem via a Novell network," complains one reader. "As such, they are absolutely worthless to me."

Here at Ziff-Davis, we use Novix

to provide a virtual IP connection over NetWare, but we connect via a leased line to our Internet provider. Pooled modems, in my experience, are a pain in the neck.

None of these commercial on-line providers comes close to the kind of performance you can get from one of the better Internet service providers, such as PSI, UUNet, or CerfNet. If you're already a customer of one of the big on-line services, their Internet packages are a good way to see what the Web is all about. If you become a Web devotee, however, you'll probably go elsewhere for your Internet services unless AOL, CompuServe, and Prodigy upgrade their Internet offerings significantly.—BM

LOOKING AHEAD

Tell me what you love and hate about these products and we'll share the information in future issues.

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PCMCIA Driver Overkill

Most of us dutifully load up to five drivers to provide socket services to our PC Card devices. Then we stick in one card and never take it out. All that wasted memory could be devoted to speeding your applications. Instead of hot-swapping. Your modem or network card probably came with a simple command line program that you can put into your AUTOEXEC.BAT file; give it a shot.—BM



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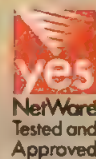
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John C. Dvorak

A Drastic Change in Direction

Are we all missing the point with Windows 95? Did someone at Microsoft stumble onto a formula for defining the future of software and hint at that formula by incorporating the year 1995 into the product name? And are we about to see a basic

change in the nature of software in particular and computing in general? Yes. All debuted by *Windows 95*.

What Microsoft is attempting to do is introduce a concept that has been used in the auto industry for decades—the model year. When you look at Windows 95, what is the most noticeable change from Windows 3.1? It's the new user interface. Buy one of those bonus disks and you have car options. Two-tone paint, leather interior.

If you look at the history of the automobile, you see that once the automatic transmission was invented, not much that was fundamental has changed in the car. Blinking turn signals and windshield-wiper speed control may be cited, but these are minor compared with the most noticeable change from year to year: body and interior design. Look at a 1935 Plymouth and a 1995 Lexus side by side. You can get to the store and back in about the same amount of time. But what's really different? It's not the functionality but the design.

This is exactly what we are about to see in software. The profit in car manufacture has never been maximized by selling to that fellow down the street who has the mint-condition 1949 Buick that he still drives every day. If everyone were like that geezer, there wouldn't be much of a car market, would there? No money would be made in software if people didn't have an impetus to buy new versions of old software.

Until recently, software companies have been improving their products at a frantic pace, but recent upgrades have little in the way of new features. Microsoft is freaked that the profits made from upgrades might stop rolling in as fast.

Well, taking a page from Detroit's notebook may not be a bad idea. Why not redo the operating system yearly, just like a car model? Just keep changing it, based more on aesthetics than

innards. There is a big difference between the 32-valve V8 in a Lexus and an old flathead Ford V8, but only hot-rodders and enthusiasts really care. When Windows NT code is slip-streamed into Windows 95 code and called Windows 97, nobody will care about anything but the interface's visible changes—the design. The look and feel.

CD-ROMs have whiz-bang interfaces with everything from spinning cubes to little video characters walking around on the screen. This is the wave of the future. The idea of a common user interface as used on the Mac and Windows is dead. Nobody cares anymore. It was an interesting experiment killed by both HyperCard from Apple (which reversed the rigidity of the common user interface concept) and modern CD-ROMs, each with a unique interface designed to be fun and functional. Microsoft knows this because every guru in the country has been observing the fact that users prefer unique interfaces on CD-ROMs and on software.

This realization will give Microsoft a huge edge over IBM, which is clueless as to the subtleties of aesthetics. IBM is peopled by talented engineers who, like all engineers, have had any artistic sensibility drummed out of them in college. "Neat holster for that hex calculator, Stu!"

Their idea of a work of art is a cool-looking blueprint.

The next wave will leave all the ugly software in the dust. People will want software that's good-looking and fashionable. Like it or not, it will be fashionable to run Windows 95. Blue skies and clouds in the background will be fashionable—until the next model year, that is. But remember, it took a long time after the "model year" was developed by Detroit before distinctive cars started to emerge.

The good news is that unlike with automobiles, it shouldn't cost \$20,000 to get a new model every year.



*The idea of a common user interface
for the Mac and Windows is dead.
Nobody cares anymore.*

Turning the stereo up

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Inside Track

Windows 95 Launch. Not much to report here except that Jay Leno and Bill Gates make a **unique comedy team**, with Gates being one of the best straight men I've ever seen. A number of unusual facts and occurrences spewed from this event that make for good cocktail party chitchat. Here're my favorites:

Bumped. The event was originally supposed to be held in the Seattle Convention Center, but "**Wheel of Fortune**" wouldn't relinquish it. The TV show was having **contestant tryouts**. The top of the Space Needle was even painted to look like the "Wheel of Fortune" wheel.

Profit Center. Companies that put up special tents for serving food or drink or sponsored giveaways paid \$10,000 for the privilege.

Harassment. Apple had a **stooge** outside the Microsoft hotel in Seattle (the Stouffer Madison) wearing a placard that had "C:\ongrtlns~.W95" printed on it. He was also handing out similar posters to passersby. Later in the day a billboard on wheels was hauling around a large sign saying the same thing. Microsoft's own "**Windows 95 Sucks Less**" T-shirt from six months ago was funnier and more to the point.

Bad Vibes. Meanwhile, there was some buzz over Microsoft's **improperly** laid-out maps and time zones in Win 95 that caused a **furor in India**, where the government said it would ban Win 95. Microsoft decided to take the map and time zone codes out of the version going there.

Transportation. School buses and municipal buses were used to move the participants to and from the Redmond campus.

Snubbed. OS/2 was never mentioned at the launch.

Counterfeit CD-ROMs. There was some buzz over an Internet announcement that someone in Europe claimed to have **50,000 fake copies of Windows 95**. Since Win 95 sells for around \$90, and a CD-ROM (including the jewel case) can be made in volume for around a dollar each, expect to see a lot of bootleg disks circulating over the next few months.

From my perspective, the most interesting aspect of the event, though, was that it was close to flawless, albeit a bit boring and sedate. Fireworks would have livened things up a little.

Immediately after Windows 95 was available, the following news report was delivered over Seattle's KING-TV: "Users are reporting long delays on the phone [support lines]. Microsoft says things are going according

*It's obvious that
the 80,000 computer
bulletin boards around
the country and the
World-Wide Web
will someday merge to
form a sort of
mega-network offering
a smorgasbord.*

to plan." The immediate retort heard in my household was, "Yeah, Microsoft intended for everyone to be put on hold." I'm reminded of the days when companies used to **keep people on hold** to give the impression that the company was really busy.

I used to do a tongue-in-cheek speech where I advocated that a company have support technicians always tell the customer, "That sounds like a difficult problem, let me transfer you to my supervisor." Then hang up. Everyone knows that few people in an office can successfully transfer a call, and the customers would **endlessly dial back** until they gave up.

Putting IBM on Hold Dept.:

In a related matter, Microsoft threw its weight around and told the promoters of the Windows Solutions trade show (Softbank)

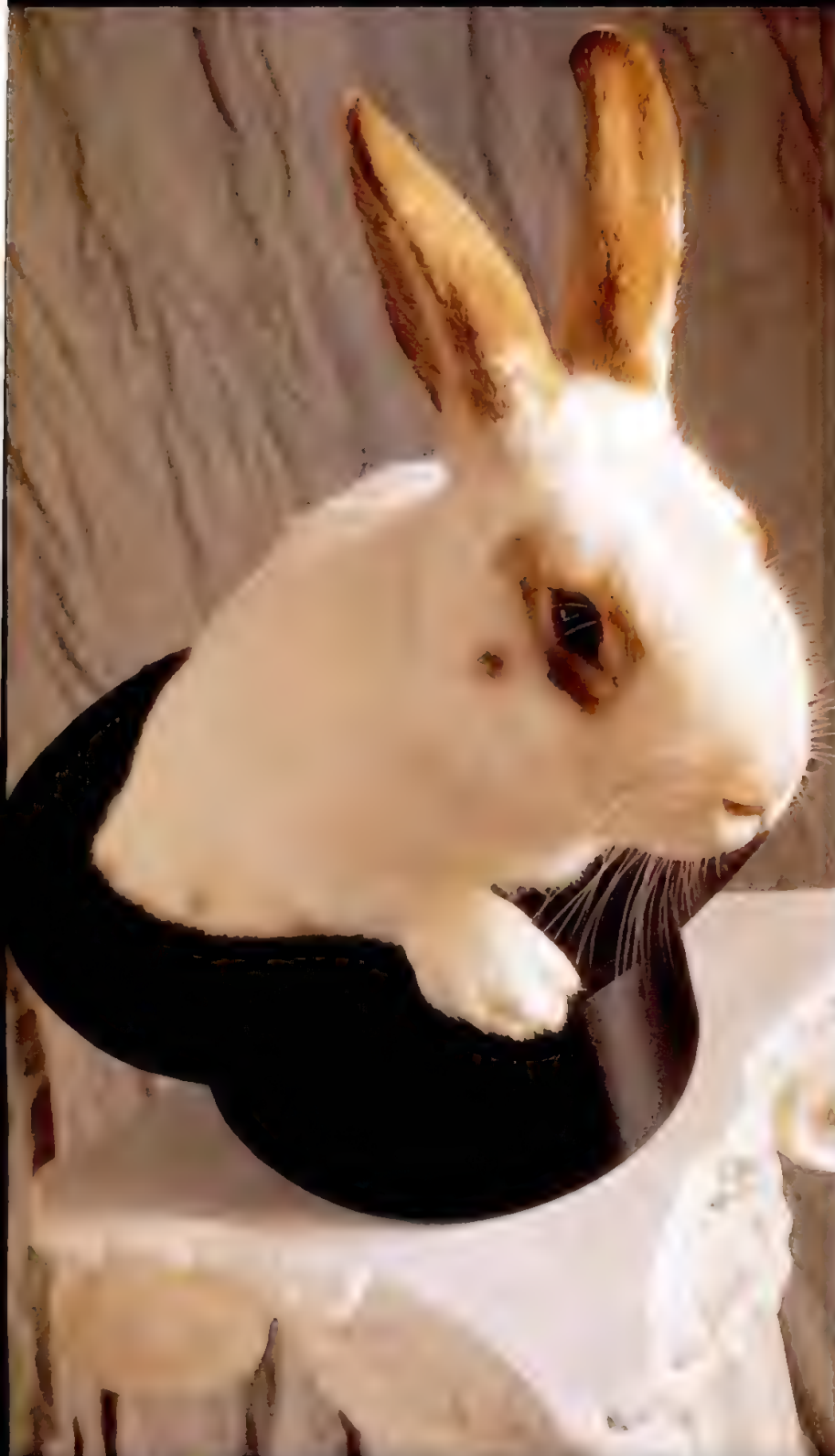
that it would **pull the rights** to use the Windows name and not exhibit at the show if Lee Rieswig of IBM was allowed to give a keynote speech. Rieswig was **pulled from the agenda**, and a memo regarding the incident was made public by disgruntled IBMers. What wasn't mentioned in the memo was that Rieswig's speech was allegedly about how to uninstall Windows 95. This is hardly keynote material and slightly rude—although conceptually funny (and potentially useful).

Overheard at OneBBCON in Tampa: The story goes that just as Prodigy began to turn a profit, Sears wanted to quit the on-line partnership with IBM. Now, there's a company with **insight into the future** of computing. Apparently IBM didn't want Sears out until it realized Prodigy was doing well, then suddenly tried to get Sears to quit. Sears got suspicious of IBM's motives and wants back in. Needless to say, nothing happened one way or the other.

Meanwhile, look for Prodigy, CompuServe, and MSN to use the AOL alias-naming conventions whereby you can have a "handle" of your own choosing, such as your last name, for your address. Try and send me a note at Dvorak@Prodigy.com to see if this works.

Other On-Line Trends of Note Dept.: It's obvious that the 80,000 computer bulletin boards around the country and the World-Wide Web will someday merge to form a sort of mega-network offering an on-line smorgasbord. You'll be able to access the Web via your local BBS and access the BBS via the Internet. Eventually it will be hard to tell the difference. The BBS community will help bring paid services to the Web, which collectively has been giving information away. If people were paying for Web access, **we'd see better sites**. As it now exists, most Web sites are nothing more than advertisements for T-shirts, coffee, and magazine subscriptions. □

Some people will be able to run Windows® 95 without more memory.



Like David Copperfield and Siegfried & Roy to name a few. But of course they can pull rabbits out of hats, make elephants disappear, and other incredible feats of magic. If you can do that, you'll be able to run Windows® 95 just fine. But if you're a bit more ordinary, you're probably going to need massive memory upgrades! That's because while the typical PC has only 4Mb RAM, you'll need a minimum of 8Mb RAM just to load Windows® 95, and 16Mb to create anything magical at all. But you certainly have a choice. You can call David Copperfield, or you can call for the Viking dealer nearest you.



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Jim Seymour

Your Eyes Come First

You know about carpal-tunnel syndrome: If you don't use palm rests and wrist rests and maybe one of the new, angled keyboards, you'll develop painful, possibly debilitating problems with your wrists and fingers. And you know about back problems: Unless

you get a good chair, sit upright instead of slumping, and take frequent breaks to stand up and walk around, you'll develop excruciating, persistent lower-back pain.

But good as those suggestions are, they overlook the most widespread health complaint among PC users.

A Lou Harris poll three years ago reported "computer-related eyestrain" as the number-one office-related health complaint. And the National Institute of Occupational Health and Safety says that of the 66 million people in the U.S. who work at PCs more than 3 hours a day, a whopping 88 percent suffer from eyestrain.

In addition to the familiar red, sore, and dry eyes, the litany of vision problems we develop with extended use of computers is a long one: generalized "eyestrain," blurred vision, tearing, headaches, color fringing, and more. Yet few computer users—and fewer employers—do much about those problems. For PC users, that's unfortunate and probably dangerous. For employers, it's counterproductive, idiotic, and an invitation to lawsuits.

Reducing glare, lowering background lighting, raising monitors to eye level, and encouraging PC users to look away from the screen every few minutes and to blink more often are important first steps. But they're not enough: We also need to address the individual vision problems of PC-using office workers.

Which usually means getting "computer glasses."

PC SPECS

For more than a decade I've used special eyeglasses optimized for the working distance from my eyes to the monitor, based on my desk setup, posture, and so on. These computer glasses have made a noticeable difference.

But until recently, not enough of a difference. Because until recently optometrists didn't know how to

prescribe glasses correctly for the glowing phosphors of computers and the virtual image they present to the eye.

When the eye focuses on sharp, black-on-white type on a conventional eye-testing chart, it tends to hold focus on that plane. So testing your vision with the ubiquitous Snellen card—used in virtually every optometrist's office—is fine for determining the correct prescription for reading glasses or sewing glasses. But it doesn't work very well for glasses for computer users.

The villain is a physiological phenomenon called the *lag of accommodation*. Simply put, when the eye attempts to focus on the inevitably softer image on a computer monitor's cathode-ray tube, or on a notebook's LCD screen, it is unable to hold focus on that virtual image plane.

Instead, the eye's focus almost immediately starts drifting outward toward a point called the *resting point of accommodation* (RPA). You subconsciously force the eye's focus back onto the monitor image, but the eye quickly begins drifting its focus back out to that RPA once again.

The difference between the point at which you want the eye to focus—the plane of the computer screen—and that RPA point is your lag of accommodation. And it is that constant refocusing, not found in any other environment or human action, that leads to the many manifestations of eyestrain.

There has been no good way to determine an individual's specific RPA—the distance varies a good deal from one person to the next—nor to devise a prescription to correct for each person's lag of accommodation. As a result, "computer glasses," no matter how carefully prescribed, no matter the competence of the person conducting the eye exam, have been rough



We need to address the vision problems of PC-using office workers.

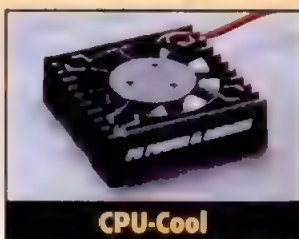
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CIRCLE 080 ON READER SERVICE CARD

Jim Seymour

approximations, inherently flawed because they were based on that unrealistic, black-ink-on-white-paper Snellen-card test.

But for the past two months I've been wearing a new pair of computer glasses that have gone a long way to overcome the lag-of-accommodation problem. The magic isn't in the glasses themselves, which are ordinary single-vision glasses ground to a conventional prescription, but in the way that the prescription was determined.

Dr. Cosmo Salibello has been working on this problem for more than a decade. Convinced that an active, "Gaussian stimulus" test card was the only valid way to simulate the eye's reaction to a computer display, he and colleagues at a little Portland, Oregon company, PRIO, developed a device that lets optometrists accurately determine an individual's RPA and build correction for that distance into prescriptions.

The PRIO Vision Tester is a backlit box, about 5 by 7 by 1 inch, that attaches to the doctor's side of the eye-examination system. It displays green and amber text against a black background, and green text against a white background. The process is quick: You read the text over and over for a couple of minutes, to start your eyes' focus-swapping routine, and then the doctor measures your ocular movement.

BEFORE AND AFTER

My new computer glasses were produced from the results of a PRIO exam, and in direct comparisons with another pair based on an ostensibly correct prescription derived from a Snellen-chart test, I see a real difference.

But the most important difference isn't detected in a quick test between PRIO-based correction glasses and conventional close-work correction lenses. It comes over time: Even after long sessions at the computer, I no longer have the weary, red-eyed, blurry vision I once blamed on the computer.

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Bill Howard

A Fork in the PC Road

Eskimos supposedly have 20 words for snow. It looks as if PC vendors soon will have 20 words to say “gray-beige” as they attempt to describe the case colors on their new home PCs. This fall we’re seeing the end of the beginning for home multimedia

PCs—the point where business and home PCs are now headed down distinctly separate paths. We’re going to see some funky case designs and colors, easier setup routines, and lots of free software. These are all important, but when we look back in ten years, we’ll realize they’re only toddlers’ steps. The next important step is to make home and SOHO PCs truly useful, as well as less intrusive.

I’ve just spent the better part of a week digging into half a dozen fall ’95 home PC offerings. Probably the least difference—and the least-exciting difference—is performance. Whether it’s a 75-MHz Pentium with just 8MB of RAM and no CPU cache or a 100-MHz Pentium with 16MB of RAM and a 256K secondary cache, they’re all adequate.

The most visible differences are in case design. The Acer Aspire and HP Pavilion have swoopy designs with softly rounded edges. (And Packard Bell even has a machine designed to be used in a corner.) It’s called “industrial design,” an odd term when applied to consumer items. Acer’s Aspire comes in charcoal or emerald, with a random pattern of cooling holes along the lower half, while the HP Pavilion’s case is finished in what’s called “quartz gray,” one of those whitish, beigish, light-grayish colors.

About half our staff who saw these units at PC Magazine Labs thought they were especially attractive; the other half said, “So?” Remember that these are still sizable system-unit boxes with at least half a dozen cables sticking out the back. No matter how handsome, the boxes are still noticeable. The evolution we need is to a system unit barely bigger than a portable computer, a thin slice that either fits under the monitor or is integrated into the monitor or keyboard. We do have some monoputers (one-piece

PCs), but most are lower-end systems with tiny monitors.

Windows front ends, or shells, are also differentiating home PCs. These are the 1995 versions of the DOS menus that read: “Type 1 for MultiMate, 2 for 1-2-3. . .” Frankly, I think they could be better. Most shells envision your PC and its programs as rooms in a house or buildings in a mall, and you go to the Rec Room for Fun & Games programs, the Home Office for Productivity, the Basement for Tools & Utilities, and so on. Some don’t work well at letting you add new programs or change printer settings; most are only two layers deep and unceremoniously boot you into Windows.

For that reason, I think we need a Windows Lite interface from Microsoft—and it shouldn’t be Microsoft Bob, a social interface with Windows-shell aspects that has turned out to be Microsoft Dog in terms of sales. At home, our 2-year-old found that Bob slowed him down because he had to go through so many steps (scratch the dog, knock the door knocker, and so on) when all he wanted to do was double-click on Grandma and Me and be on his way. And our 5-year-old discovered that you can drag the fire from Bob’s fireplace into the middle of the living room; not a good social value to learn.

If a PC wants to do voice mail, there needs to be an

LED on the system or monitor that tells you, at a glance, that you have messages waiting. The LED ought to be right next to the mute button (non-existent on most PCs) to silence the speakers. Why is it that when you switch among radio or TV stations, the difference in volume is minimal, but when you switch among different programs on a PC, the difference can be deafening?

Charcoal and quartz-gray cases are cool, but that kind of beauty is only skin-deep. □



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By John Garriss

Here's a message for all you NetWare 3.11 and 3.12 administrators out there: It's time to expect more from your operating system. File and print services, which were once the hallmark of a solid network operating system (NOS), have since become a commodity feature. New products are entering the scene offering everything from global directory services to symmetric multiprocessing (SMP) architectures. These new

Illustration by James Bozzini

INSIDE



It's the burning question hanging in the air anytime a couple of network managers get together for longer than 5 minutes. After they've caught up on their latest near-fatal crashes and user mishaps (and of course exchanged philosophies on Windows 95), the talk moves quickly to network operating systems. Specifically, what are you running and what are you likely to move to and when?

SENIOR TECHNICAL ANALYST John Garriss, who often tackles the big issues here in Network Edition, weighs the pros and cons of the most frequently asked NOS question: Should you upgrade to NetWare 4.1 (or something else)?

WE'VE ALSO GOT A SEPARATE comparative review of three leading protocol analyzers. Technical director of networking, Rob Lipschutz, put these packages through their low-level paces. Rob recommends that every network manager invest time in one. (Page NE29.)

IN FIRST LOOKS, we consider interesting packages from Firefox and Ipswitch that better your Internet e-mail capabilities. Reviewer Ryan Tabibian says that each offers impressive enhancements. (Page NE37.)

CONTRIBUTING EDITOR Tony Pompili, our resident Notes expert, gives us a first look at a much-needed management add-on package for Notes from Lotus itself. Tony notes that while the management is welcome, some requirements for wide-area management complicate installation. (Page NE37.)

WE ALSO TAKE A LOOK AT another entry in the remote-access market, this one from U.S. Robotics. Contributing editor Steve Rigney says hardware installation went well, but the initial software portion was unnecessarily cumbersome. (Page NE40.)

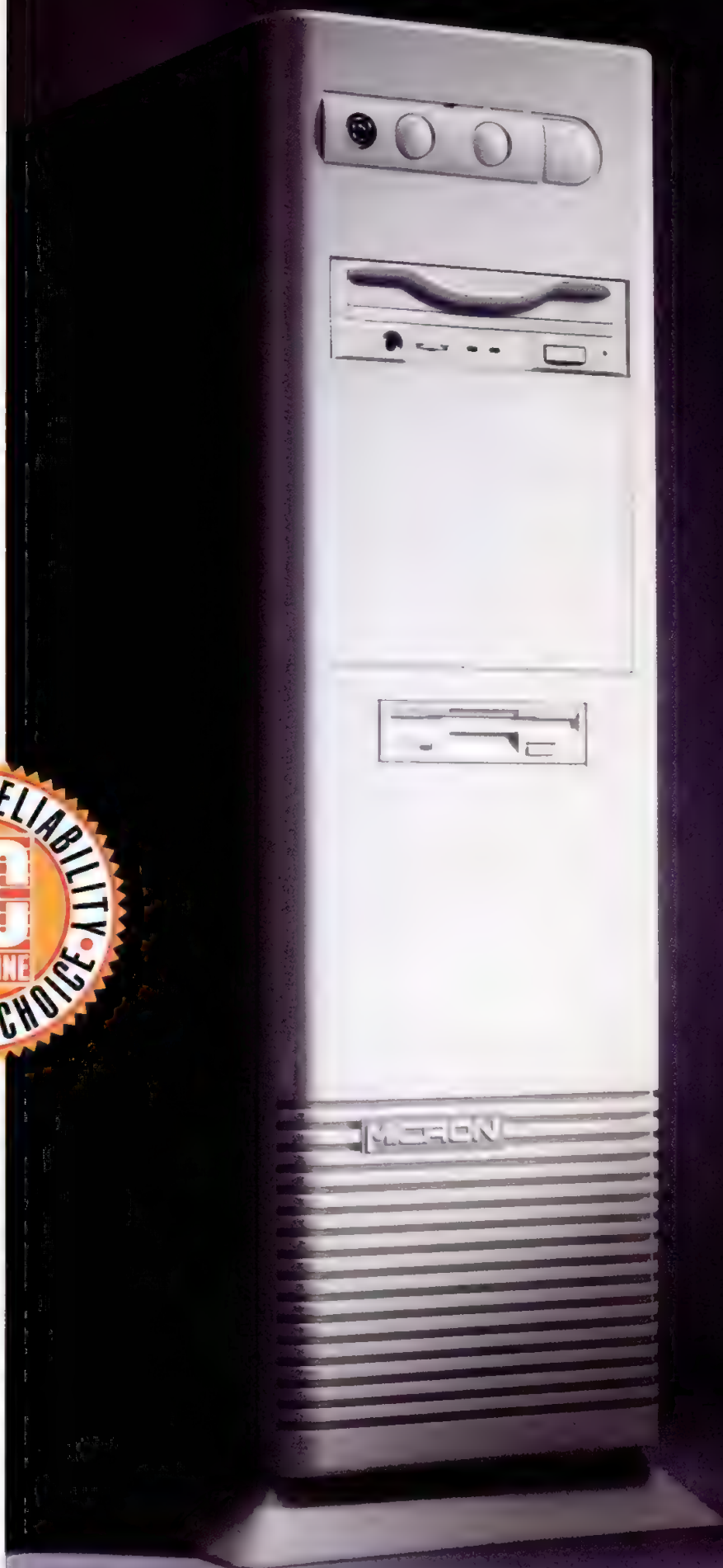
—Gail Shaffer

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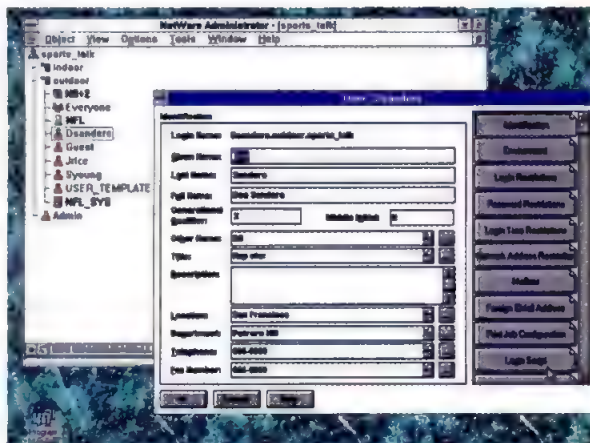
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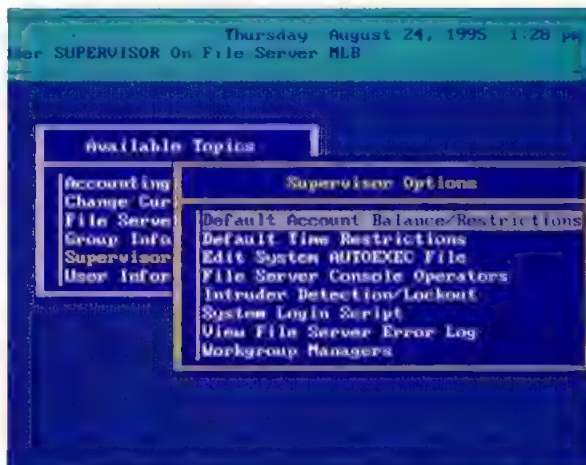
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NWAdmin vs. Syscon



NWADMIN: The administrative utility provided with NetWare 4.x, called NWAdmin, is both more powerful and easier to use than its NetWare 3.x counterpart, Syscon. You can maneuver through different directory contexts to get information residing anywhere on your global network. All of your objects, including servers, users, and print queues are arranged in a hierarchical format. Just click on any object to view or edit its properties.



SYSCON: The NetWare 3.x utility shows information only on a per-server basis (three lower screens). You have to flip through multiple screens to get at the information you want. You can create user templates that contain default properties for any new users you create in the future. You press buttons for quick viewing and editing of all pertinent information about your users.



products will let you manage your network more easily and run the most demanding client/server applications on a single server platform, and you'll be able to lower your support costs in the process.

Just a few years ago, our expectations of a NOS were much more modest. At a time when NetWare 3.11 and later NetWare 3.12 defined the NOS market, a NOS didn't do much more than simple file and printer sharing. Back then, NetWare 3.x fit the mold perfectly: It was fast, it was fairly easy to manage, and most important, it was reliable. You simply stuck it in a closet and let it do its thing.

These days, even Novell is advocating the move toward the next generation

NOS. NetWare 4.1, which was once viewed by Novell as a solution primarily for enterprise networks, has been repositioned to be its preferred operating system for networks of all sizes, small or large. It's got a lot of great features to recommend it, and Novell has brought the pricing down to very reasonable levels.

Novell is also feeling more heat from other vendors. Competing products such as Microsoft Windows NT Server and OS/2 LAN Server are warranting serious consideration, offering features such as preemptive multitasking and SMP capabilities, which NetWare still lacks.

For the NetWare 3.x administrator, the choices are more complex. Should your company upgrade to NetWare 4.1? How

do Novell's competitors stack up? And perhaps most importantly, what are the major migration issues you'll need to tackle as you plan an upgrade strategy? In this article, we'll tell you what you need to know to make an informed decision for your company.

THE LONG ROAD TO NETWARE 4.1

No smart network administrator would ever overhaul the network infrastructure just for a few nifty features. To justify the cost of migrating to NetWare 4.1 or any of its competitors, the product must have the power to change the way people work. It could accomplish this by simplifying administrative tasks, by enabling new and more powerful technologies, or by reduc-

Visual Basic

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```
Sub PubPubID_Change ()
Dim SavePlace As Variant
Dim SQL As String
If Loading Then Exit Sub
PubsTitles.Clear
PubsAuthors.Clear
SQL = "Select distinct Title from Titles"
SQL = SQL & " where titles.PubID = " &
    PubPubID.Text
DataCtl(PubsList).RecordSource = SQL
DataCtl(PubsList).Refresh
Do While Not DataCtl(PubsList).Recordset.EOF
    PubsTitles.AddItem
    DataCtl(PubsList).Recordset(0)
DataCtl(PubsList).Recordset.MoveNext
Loop
If PubsTitles.ListCount > 0 Then
    PubsTitles.ListIndex = 0
SQL = "Select distinct Author from Titles,
    Authors"
SQL = SQL & " where Titles.AU_ID =
    Authors.AU_ID and "
SQL = SQL & " titles.PubID = " & PubPubID.Text
DataCtl(PubsList).RecordSource = SQL
DataCtl(PubsList).Refresh
Do While Not DataCtl(PubsList).Recordset.EOF
    PubsAuthors.AddItem
    DataCtl(PubsList).Recordset(0)
DataCtl(PubsList).Recordset.MoveNext
Loop
If PubsAuthors.ListCount > 0 Then
    PubsAuthors.ListIndex = 0
End Sub
```

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In the Labs: Three Ways to Migrate

Novell documents three specific methods for upgrading your NetWare 3.x servers to NetWare 4.1. One approach is called *in-place* migration and uses the INSTALL program that comes on your NetWare 4.1 CD. The other two are called *across-the-wire* migration and *same-server* migration. These latter two methods use a NetWare utility called MIGRATE. In our labs we set up a test-bed of five NetWare 3.12 servers and multiple clients and tested each migration process.

IN-PLACE MIGRATION

This is the most straightforward of the three methods. With in-place migration, you upgrade an existing NetWare 3.12 server to NetWare 4.1 using your existing hardware, disk partitions, and NetWare volumes. All of your users and groups are automatically moved from the NetWare 3.x sources into the NetWare 4.1 NDS object store.

You run the in-place migration at the server, using NetWare 4.1's Install program.

The actual installation process is much like a standard NetWare 4.1 installation. The program updates startup files on the DOS partition, you select your disk and LAN drivers, and then the program updates files on your current NetWare volumes. Because we performed the in-place migration first, we were instructed to create a directory tree and context into which the program placed all our NetWare Directory Services (NDS) objects.

In addition to being pretty painless, the in-place method is the only one that automatically updates all your users' passwords. On the other hand, it doesn't let you change the block size of your NetWare volumes for faster performance. If you want to do that, you should perform either an across-the-wire or same-server migration.

ACROSS-THE-WIRE MIGRATION

The most useful approach if you want to install NetWare 4.1 on a new piece of hardware, this migration process requires three computers. First is your existing NetWare 3.x server, second is a new computer that will house your NetWare 4.1 server, and third is a DOS client system from which you run the Migrate utility.

We started by installing a fresh copy of NetWare 4.1 on the new server. During installation, we inserted our new server into the NDS tree created during our in-place migration. Next, we prepared our 3.12 server. This consisted primarily of deleting unnecessary files and running the Bindfix utility

to clean up mail directories and trustee assignments. You should also back up your source server before you attempt the migration.

Our third step was to run the Migrate utility from our DOS client. This utility transferred all of our NetWare-specific information (such as users and groups) and data files from our 3.12 server to the 4.1 box. Migrate works not only with 3.x but also lets you transfer information from NetWare 2.x, Microsoft LAN Manager 2.0, and OS/2 LAN Server 1.0 to 1.3 servers. After Migrate finished transferring all the necessary files, it created a useful migration report, detailing all of our selections, completed actions, and error messages.

There were a few final tasks to complete the server migration. First, we ran a utility called Migprint to convert all our print queues and print servers (Migrate doesn't convert printer-based resources). Second, we ran Uimport to convert user login scripts from 3.12 format (stored in users' MAIL directories) to 4.1 format (stored as a property in the user NDS object). Finally, since

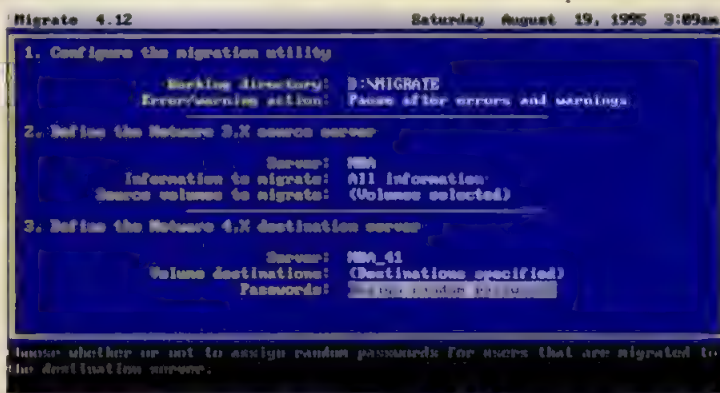
passwords aren't converted over the wire we generated new passwords for all our users.

SAME-SERVER MIGRATION

The same-server migration is a cross between the other two methods. Although you use the same hardware when upgrading your server to 4.1, you actually use Migrate when performing the migration.

You begin the same-server migration with a full backup of your source server. Then you run Migrate from a DOS client to copy all of your NetWare-specific information from the server to the DOS system. Next, you install a fresh copy of NetWare 4.1 on your server, wiping out your NetWare partitions and recreating your volumes from scratch. Finally, you rebuild your new 4.1 environment, first by restoring all your data files from your backup, and then running Migrate again to transfer all your saved NetWare information back to your new 4.1 server.

One advantage to the same-server migration over the in-place method is that when you install a 4.1 server, you can configure your NetWare volumes to use a 64K block size for faster performance (NetWare 3.12 defaults to using 4K blocks). On the other hand, Migrate won't back up data files during a same-server migration. Instead, you either need to perform an across-the-wire migration or restore your data from your most recent backup.—JG

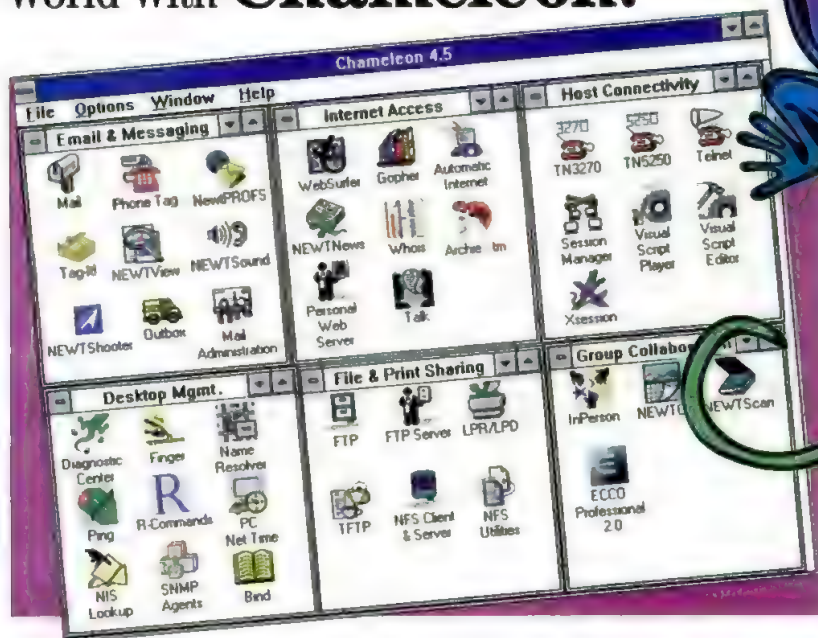


HELPFUL UTILITY: NetWare's Migrate walks you through changing over information from 3.12 to 4.x. But it doesn't handle printer-related moves; for that you use Migprint.

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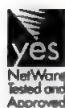
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NDS: How It Works

One of the principal jobs of any network operating system is to give the network administrator a way to arrange and manage all the clients and resources that reside on and use the network. In NetWare 4.x, this capability has been improved dramatically over previous versions with NetWare Directory Services (NDS).

NDS gives administrators a centralized view of all the resources within their global networks. While earlier versions of NetWare primarily give single-server views of the network, NDS makes it possible for information from multiple NetWare 4.x servers to appear to come from a single source.

With NDS, all the information about network resources is represented in a hierarchical structure. This *directory tree* stores all of its information as objects in a distributed NDS database. Although the basic structure of all NDS trees is similar, the shape of any given tree depends on the size and logical breakdown of the organization the network supports.

The diagram here shows the structure of a typical NDS tree. At the top is the root object, which holds the name of the directory tree. Branching off the root object are two other objects, the country object and the organization object. The country object is optional and often is omitted; the organization object usually refers to the name of the company. Under the organization object lie a number of objects generally referred to as *organizational units* (or *OUs*).

OUs represent conceptual subdivisions of your company. They logically partition your network resources into more manageable units. We used Sales and Engineering as our first-level OUs. We then created another set of OUs within Engineering to represent branch offices in Denver and Portland. It's a good to keep OU layers to a minimum. As you add more levels, it gets more difficult to name your objects.

Country, organization, and organizational unit objects are called *container objects*, because they can hold other objects (including other container objects). *Leaf objects*, on the other hand, represent the end of a branch in the tree. Leaf objects most often represent the basic resources that administrators access to manage their networks. Users, groups,

print servers, and NetWare volumes are examples of leaf objects. A user object, for example, will store within it properties such as user name, full name, login script, and trustee assignments.

Once you create your directory tree, it's easy to identify any object uniquely in the hierarchy. Just start at the object in the lowest level of the hierarchy, and work your way up. In our diagram the user CJONES is in the organizational unit SALES, in the organization PCMAG in the country US. So the full NDS name of this user is CJONES.SALES.PCMAG.US.

DATABASE PARTITIONING AND REPLICATION

One of the best things about NDS is that any administrator or NDS-aware app with proper security privileges can access any information in the NDS hierarchy. But in reality the NDS information is often distributed, or partitioned, across multiple NetWare 4.1 servers in separate NDS databases.

NDS automatically ensures that any NetWare 4.1 server can access any information stored in the NDS directory tree. If the information isn't stored locally, NDS follows a set of predefined steps to ensure that the other 4.1 server that contains the desired information will send it where it needs to go.

A single segment of the NDS database is called a *partition*. An NDS partition consists of a container object, any objects contained within it, and all the data associated with those objects. You can store different partitions on different 4.1 servers, and you can create copies, or *replicas*, of NDS partitions on other 4.1 servers. Once you create replicas of NDS partitions, NDS automatically ensures that information in all the replicas is up-to-date. If someone makes a change in one of the replicas, the updated information is sent to the others.

You should plan your NDS partitions and replicas carefully to minimize traffic that can result from updates and queries going over your LAN or wide-area pipes. It's also good to store replicas of all your NDS partitions on multiple servers. If a server goes down, you can use a replica on another server to handle login and other requests in its

ing the level of technical expertise required to get the job done.

In Novell's view of the world, the primary motivating factor driving companies to upgrade to NetWare 4.1 is NetWare Directory Services (NDS). There are other new features and enhancements to 4.1, including improved installation, disk compression, and hooks into hierarchical storage management (HSM). But NDS is by far the single most compelling reason to upgrade. NDS is Novell's implementation of a global directory and naming service, whereby all the information about your essential network resources is stored in a centrally managed database.

The concept of a global directory has

been around for a while, but it's only recently that the idea has started to take hold. Banyan Systems, for example, has offered a global directory called StreetTalk in its VINES operating system for years. And Novell first introduced NetWare Directory Services in its largely unsuccessful rollout of NetWare 4.0 in 1993. Back then, most people decided to stick with their older NetWare networks for several reasons: 4.0 had a number of bugs and poor migration utilities, people were unfamiliar with basic NDS concepts, and the new version cost a lot of money.

But Novell has since done a good job of addressing all of those issues. For one thing, NetWare 4.1 is a drastic improve-

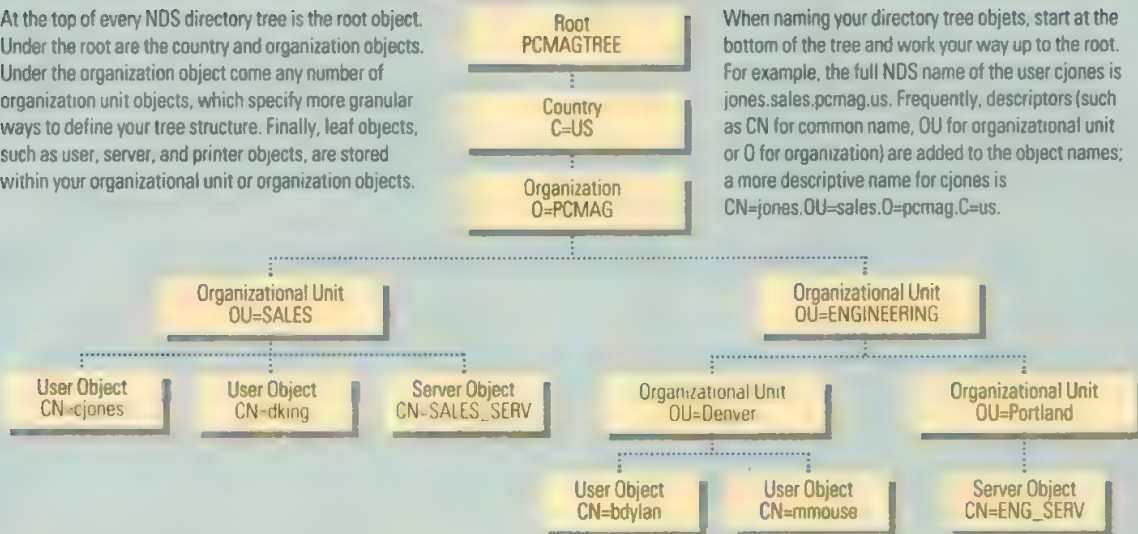
ment over earlier 4.x versions. In fact, it earned the Editors' Choice in our most recent NOS roundup ("The Versatile Network Operating System," May 30, 1995).

Novell has also done some product repositioning. The company's earlier plan to position 4.x as its high-end NOS scared away many potential customers who couldn't fully justify an immediate need for NDS. But now Novell is actively pushing NetWare 4.1 for all new server purchases, and the company has lowered the price of 4.1 so that it costs exactly the same as 3.12.

But despite Novell's recent repositioning, the fact remains that the benefits of NDS are more naturally realized in large,

A Sample NDS Directory Tree

At the top of every NDS directory tree is the root object. Under the root are the country and organization objects. Under the organization object come any number of organization unit objects, which specify more granular ways to define your tree structure. Finally, leaf objects, such as user, server, and printer objects, are stored within your organizational unit or organization objects.



When naming your directory tree objects, start at the bottom of the tree and work your way up to the root. For example, the full NDS name of the user cjones is jones.sales.pcmag.us. Frequently, descriptors (such as CN for common name, OU for organizational unit or O for organization) are added to the object names; a more descriptive name for cjones is CN=jones.OU=sales.O=pcmag.C=us.

place. Replicas also serve as reliable backups. A replica will likely be more up-to-date than an NDS partition recovered from tape.

WORKING WITH OLDER ENVIRONMENTS

NDS is specific to NetWare 4.x servers; NetWare 2.x and 3.x servers store information about users and groups in an entity called the NetWare *Bindery*. Client software that assumes NetWare 2.x or 3.x servers on the back end, including the older DOS NETX requester, communicates with NetWare servers using the NetWare Bindery. NetWare 4.1 includes a feature called *Bindery services* to provide backward-compatibility with software, such as NETX, which makes calls to the NetWare Bindery.

Bindery services are enabled by default when you install NetWare 4.1. On each NetWare 4.1 server, you specify a *Bindery context*, which specifies the container object where

your user and group objects exist in the directory tree. All of the objects within the Bindery context will appear as a Bindery to NetWare 2.x and 3.x clients. With NetWare 4.1, you also can set multiple Bindery contexts on the server if the objects you need reside in more than one container object.

Bindery services do carry some limitations. If a user logs in to a server that uses Bindery services, he cannot access any of the objects stored in the NDS directory tree. If he wishes to use the administration tool NWAdmin, for example, he must login to NDS using newer client software such as the Virtual Loadable Module (VLM) software provided with 4.1.

Bindery services is useful because it lets you change your NetWare 2.x and 3.x networks to 4.1 in gradual steps. You can, for example, change your servers to 4.1 first, then gradually upgrade the software on your clients later to take full advantage of NDS features.—JG

multisite NetWare shops than in small workgroup LANs. The fundamental purpose of NDS is to create a single, global directory to manage all of your network resources. As you add more NetWare servers, the task of managing those servers separately can become a costly chore.

Using the Bindery-based directory structure in NetWare 3.x, for example, when you add a user to five servers you need to go to each server and make changes five separate times. But with a NetWare 4.1 network using NDS, you would add a user only once, and changes would be propagated to each of the servers you specify (for a brief tutorial on NDS, see "NDS: How It Works" above).

The benefits of NDS, however, extend beyond simple user and group management. NDS uses a distributed, replicated database to store all of its information about network entities. These network entities, by default, include things like users, groups, print servers, and network volumes, but the database can be expanded to include just about anything you want.

Once the information is in the NDS database, you can access any portion of it from anywhere within your enterprise network. NDS automatically handles all of the replication and update mechanisms behind the scenes, so that the information you request will appear to be stored locally even if it actually resides 3,000 miles away.

For companies with just a couple of NetWare servers, NDS probably won't make enough of a difference by itself to justify an upgrade to NetWare 4.1. For large companies, the benefits of NDS are clearer, but it still will take some time before they realize the full value of NDS. This is due in part to the relative lack of NDS-optimized applications—although things are definitely getting better.

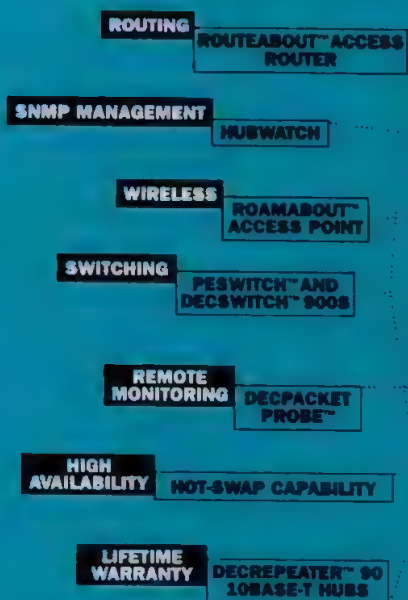
A new crop of NetWare applications, including management, backup, and messaging products are starting to show improved hooks into NDS databases. NDS-optimized applications can make your life a lot easier. For one example, a messaging server that works with NDS can integrate

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Notes from the LAN Trenches

Most network administrators would agree that the Novell developers did a good job designing the upgrade and migration features in NetWare 4.x. But they'll also tell you that Murphy (and his law) are waiting somewhere, cooking up problems that never even occurred to the developers. (This is, after all, networking.)

Depending on the type of hardware you use, the number of nodes on your network, and the various versions of drivers and programs on your computers, even the best migration tools and utilities won't always save you from a few new gray hairs.

We explain the three methods for upgrading your NetWare 2.x or 3.x server to NetWare 4.x earlier in this article (see "In the Labs: Three Ways to Migrate"). Those observations are based on some intensive work we did at PC Labs, West Coast, in Foster City, California. But here we've added some notes that were accumulated from working on live LANs in the field—both on the migration approaches and on migration in general. Out in the trenches, you learn that every operation on a network has its pitfalls and problems. Here, we've put together a short list of observations, along with some of the more common gotchas you might run into.

IN-PLACE MIGRATION

The in-place upgrade is probably the fastest method. Because your data files are already on the NetWare 2.x or 3.x server, you don't have to worry about copying them over. Be forewarned, however, that you must make sure to have the proper hardware resources on your existing server in order for the in-place upgrade to work.

For example, NetWare 4.x needs a 10MB to 15MB DOS partition on the file server just to hold the NOS system files. But because the NetWare 3.x DOS system files would fit on a 1.44MB floppy disk, you probably don't have a large DOS partition in place on your existing server. Oops.

If you don't have a 10MB to 15MB DOS partition, your automatic upgrade options begin to disappear. In fact, by the time you back up all of your data and reformat and partition your hard disk, you might as well just do a new NetWare 4.x installation instead of an upgrade. Even if by some chance you do have a large enough DOS partition on your hard disk, you should be sure to perform a complete backup and verify your data before you start your upgrade.

ACROSS-THE-WIRE MIGRATION

The across-the-wire migration method is useful if you install NetWare 4.x on a new server and you want to copy your data from your existing server. Make sure you realize, though, that this approach requires three PCs—your existing NetWare server, a DOS client PC, and your new NetWare 4.x server.

And because you must install NetWare 4.x on a new PC and then copy all of your data across the wire, this method also takes the most time. Fortunately, Novell provides a DOS-based Migrate utility that allows you to select the information that you want to transfer from your NetWare 2.x

or 3.x server to your new NetWare 4.x server.

The migration program is extremely easy to use, but it doesn't always work as advertised. For example, in some informal testing we did, when we used Migrate to transfer our Bindery information to the new server, all of the passwords were missing on the new server. We ran the migration program two more times and eventually all of the Bindery information made it across.

Although you could use the Bindfix (Bindery fix) and the Bindrest (bindery restore) utilities to copy the Bindery information manually to the new server, NetWare 4.x replaces the Bindery database with NDS, so you would still have to convert the database. Thus, if you use the migration utility, make sure it did its job completely before you do anything to the original files.

Another problem you might encounter when you migrate is missing print queues. Novell provides a utility called Migprint that is designed to transfer all of your print server and queue information. Every time we used this option, though, the print servers and queues migrated successfully, but we could not print. All of the information seemed to be there, but the queues did not attach to the print servers. We never solved the problem, and in the end we had to delete and recreate the queues in order to print.

DRIVER PROBLEMS

NetWare 4.x is designed to offer backward compatibility with NetWare 3.x and earlier versions. We have observed, however, that some of the NLMs and other drivers that worked with NetWare 3.x do not work with NetWare 4.x. For example, we used Corel's CorelSCSI to mount an Iomega Laser-Safe optical drive on our NetWare 3.12 file server. Unfortunately, the Corel drivers do not work with NetWare 4.1, and we were unable to install the optical drive on our new server. Before you upgrade, make sure that all of your NLMs and disk drivers will work with NetWare 4.x.

CLIENT PROBLEMS

The most obvious but overlooked problems you'll encounter in migrating to NetWare 4.x have to do with your network client PCs. When you upgrade to NetWare 4.x, you will probably have to go to each client PC and run the client install utility from the server. This is not a big deal, unless you have hundreds of client PCs. You might also have to edit the NET.CFG file on all of your clients and add the Preferred Tree statement in order to connect to the new server in NDS mode.

EXPECT THE UNEXPECTED

This is only the short list of problems we've observed over the past year. You might encounter different ones (or Murphy might spare you this time). The most important thing to remember is to give yourself enough time to cope with anything that could come up. Whatever you do, don't plan to upgrade your server after work in a few hours. Instead set aside a long weekend. Just plan to stay a while and order in pizza.—Steve Rigney

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NOVELL

Nine Things to Do Before You Upgrade Your Server

By Steve Rigney



DO A COMPLETE BACKUP AND RESTORE. The chances of your data getting deleted are between slim and none, but your NOS could get corrupted. And without a working NOS, you won't be able to get to your data. Do the restore portion to reacquire yourself with the process, just in case you need it for real.



CHECK YOUR NLMs AND NETWORK DRIVERS. Most versions of NetWare are backward-compatible, but you should check your NLMs just in case. NetWare 2.x, for example, doesn't use NLMs; it uses VAPs (Value Added Processes). You can't load a VAP on a NetWare 3.x or 4.x server (and you can't load an NLM on a NetWare 2.x server), so make sure you can get NLMs to replace your VAPs. Also, some NLMs do not work across all versions, so check with your driver vendors.



RECORD YOUR PRINT SERVER AND QUEUE INFORMATION. Write down all of your printer names and configurations before you upgrade. For some unexplained reason, the Novell migration utility has a hard time transferring your print-server and print-queue information between servers. All of the information makes it across, but the printer won't attach to the server. You will probably have to recreate your print servers and queues.



RUN THE BINDFIX (BINDERY FIX) AND BINDREST (BINDERY RESTORE) UTILITIES. The Bindfix utility will automatically make a backup of your Bindery information, including user names, groups, and passwords. Bindrest will restore the Bindery back-up to any server you choose. In addition, always keep a backup of your Bindery, in case it gets lost during the upgrade.



CHECK YOUR APPLICATIONS. Some applications, especially vertical apps, do not work with certain NetWare shells, such as the VLMs used in NetWare 4.x. If you are currently using the Netx shell and you need to switch to VLMs in order to run NetWare 4.x,

make sure your applications will still work. You can still use Netx drivers with NetWare 4.x, but only in Bindery emulation mode. Check with the application vendor or with Novell.



CHECK YOUR SERVER HARDWARE. NetWare 4.x requires more resources than earlier versions. For example, you need a 10MB to 15MB DOS partition on your hard disk just to install the server files. NetWare 3.x, on the other hand, could run from a floppy disk. If you do not have a large enough DOS partition, you will have to reformat your hard disk. Make sure that your existing or new PC has the resources to run your new NOS.



CHECK YOUR ETHERNET FRAME TYPES. Earlier versions of NetWare, such as NetWare 3.11 and lower, used the 802.3 frame type on Ethernet networks. Version 3.12 and 4.x rely on the 802.2 frame type to communicate with clients. If you can't connect to your new server, a good place to look is at the frame types you are using.



CHECK YOUR INTERNAL NETWORK NUMBER AND YOUR IPX NUMBER. Lots of people are stumped by incorrectly matched network and IPX numbers. If you are migrating across the LAN, you will need to have both servers running at the same time. Remember, however, that each NetWare server must have a unique network number—but the same IPX cable number. If you try to use different IPX cable numbers, you will receive an annoying error on your system console. Also, if you get the numbers wrong you can't see both servers.



GIVE YOURSELF ENOUGH TIME. Don't underestimate this tip. Don't try to upgrade your server in a single afternoon, unless you like staying up all night long. You want to make sure that you have access to technical support when you are performing the upgrade—you may not want to work on Sunday, for example. Make an estimate of how long your worst-case scenario would take. Then double it, and allow that much time. You won't regret it.

its user lists dynamically with those found in the NDS database. This eliminates the need for administrators to manage two user lists separately.

Applications that don't work with NDS can still run under 4.1 using *Bindery services*, a feature that lets 4.1 servers appear as NetWare 3.12 servers to non-NDS applications. It's clear, however, that the future of NetWare, in Novell's outlook, depends squarely on the future of NDS, and that true NDS applications are a major factor in NetWare's ultimate success.

THE PERFECT APPLICATION SERVER

These days, a lot of people use their NetWare 3.11 and 3.12 servers to run complex applications such as databases and Internet services. Even though this is the case, NetWare 3.x is often criticized as an application-server platform, mostly because its

architecture is optimized for file and print. Its lack of protected memory, of preemptive multitasking, and of multiprocessing capability are the most frequent complaints. That's in addition to the inherent difficulty in writing and managing NetWare Loadable Modules (NLMs). Many companies are driving the push to upgrade based on a desire to standardize on a single server platform to handle all file, print, and application services.

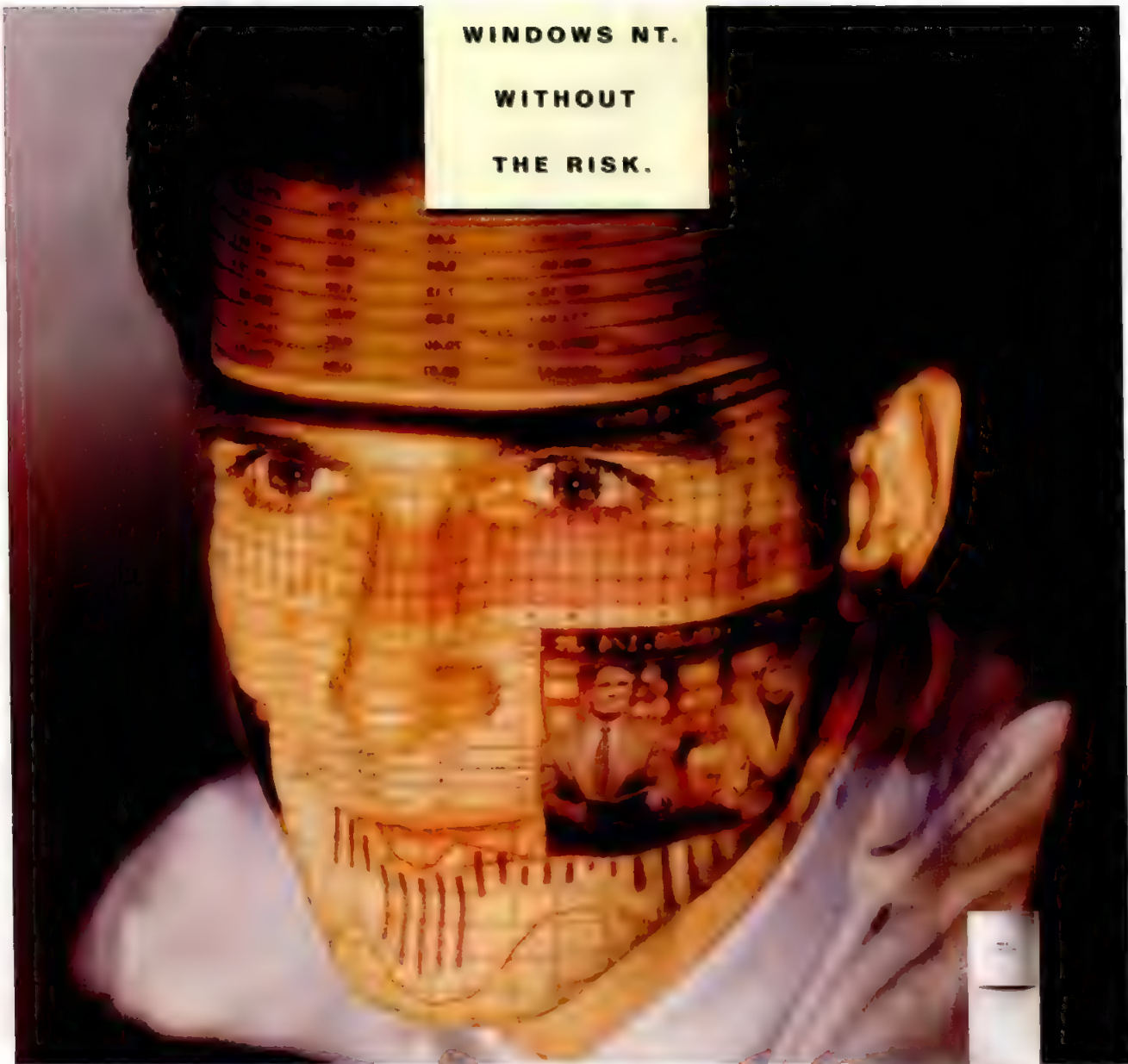
Competing products such as Microsoft Windows NT Server 3.51 and OS/2 LAN Server 4.0 do address this specific need. In addition to file and print, these products offer SMP architectures, which deliver scalable performance for running client/server applications. Other architectural enhancements include memory protection, which keeps the server running in case of an application crash.

The case for Windows NT Server is particularly compelling. Windows NT Server's file-server performance has improved enough to rival that of NetWare, and its other features recommended it as the Editors' Choice for an application server OS platform for the article "Serving Up Apps" in this issue.

The growing interest in using Windows NT for an integrated file/print/application server solution has convinced Microsoft to begin targeting current NetWare 3.x administrators for switching over. The company is positioning Windows NT as the natural migration path from NetWare 3.x, and it has announced a set of products geared specifically for sites that want to switch from NetWare to Windows NT.

These products include File and Print Services for NetWare, which makes Windows NT servers appear to be NetWare

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Microsoft: Tools to Smooth the Upgrade

The new generation of NOSs is upon us. To keep your company competitive, sooner or later you'll need to upgrade your NetWare 2.x and 3.x servers. Powerful new features, such as global directory services, preemptive multitasking, and symmetric multiprocessing (SMP), provide the impetus for moving forward. And the benefits of centrally managed network resources and powerful client/server desktop applications far outweigh the risks. Standing still, you'll simply lose too much ground.

So you make the decision to move up. But what if you also consider migrating from one NOS to another in the same

process—say from NetWare to Microsoft Windows NT? It can seem a complex task. But Microsoft is betting that by providing administrators the necessary tools to step them smoothly through upgrades, it will ease the confusion of the migration and integration process. It makes a compelling case for Windows NT.

The primary Microsoft integration tools for sharing resources with NetWare 3.x networks are the Gateway Services for NetWare and NWLink. Microsoft's version of IPX/SPX. These tools are both included with Windows NT. They permit systems running Windows NT Workstation and Windows 95 clients of the Windows NT Server access to file and print resources on NetWare servers. They do so by letting Windows NT's Server Message Block (SMB) protocol communicate with Novell's NetWare Core Protocol (NCP). (NWLink is not available for Windows for Workgroups; you must use Novell's NetWare client software instead.)

Microsoft's migration strategy involves two optional products that contain three key tools for migrating from NetWare 2.x and 3.x to Windows NT. File and Print Services for NetWare (FPNW) makes a Windows NT server act like a NetWare 3.x-compatible file and print server. It allows Windows 3.1, Windows for Workgroups, and Windows NT Workstation clients file and printer access without adding additional client software. Included as part of FPNW is Migration Tool 1.1, for migrating user and group information. Directory Services Manager for NetWare (DSMN), which allows you to manage NetWare 3.x users in mixed networks of NetWare 3.x and Windows NT servers.

BLENDING IN, A STEP AT A TIME

FPNW, currently a Release Candidate, makes a Windows NT Server look like a NetWare 3.x-compatible file and print server to your clients. By imitating NCP, Microsoft makes it possible to use some of Novell's administration tools. In our tests, we found both SysCon and PConsole worked without a problem. But the imitation of a NetWare 3.x server is not

entirely complete, and you lose support for some features, such as User Disk Volume restrictions and NLMs.

Migration Tool 1.1 moves NetWare 2.x or 3.x user and group accounts, files and directories, and security and permissions from a NetWare 2.x or 3.x server to a Windows NT Server 3.51. The migration of login scripts is not yet working.

NetWare 3.12 encrypts passwords, so they can't migrate to Windows NT. But you've got some alternatives. You can specify No Password, specify the user's name as the password or a single password for all users, or map a password for each user at the time of the migration. The trial migration feature

is also useful. It lets you preview LOG files that show you what you would get if you migrate with the present settings.

MANAGING THE MIX

DSMN enables you to manage NetWare 2.x and 3.x users in mixed networks of NetWare and Windows NT servers from Windows NT's User Manager utility. It also allows NetWare 2.x and 3.x shops to make the transition incrementally to Windows NT 3.51 Server, and it provides a single log-on to multiple servers. You use the Synchronization Manager to select a NetWare 2.x or 3.x server that you would like to manage, then select which

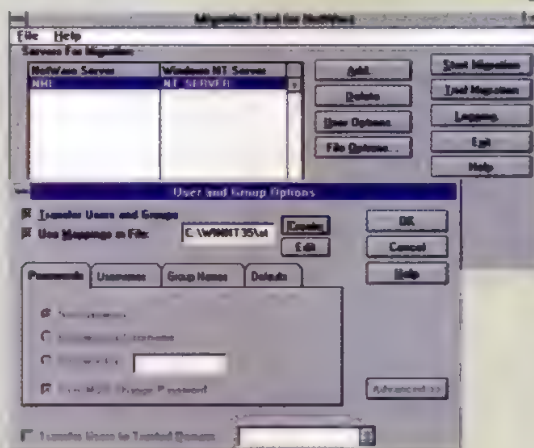
users and groups to propagate to the domain. Other changes are propagated back to the NetWare 2.x or 3.x server.

The most glaring drawback of DSMN is that it does not work with NetWare 4.1's NDS directly and leaves the network administrator with no means of central administration for a network consisting of both Windows NT Server 3.51 and NetWare 4.1 servers. DSMN records the Bindery at the time of migration and requires you to make all the changes from the Windows NT Server 3.51 down to the NetWare 2.x and 3.x servers. Changes we made after the migration to users and groups in NetWare's 3.x Bindery using NetWare's SysCon utility could not be seen by DSMN and left the servers out of synch.

NEXT-GENERATION DIRECTORY SERVICES

Where do you migrate from there? Microsoft says to next-generation directories that will use an object store to allow access to all information on the network. The Open Directory Services Interfaces (ODSI) make it easier to manage, query, and write applications for multiple network directories. Microsoft sees these next-generation directory services as a database merged into the operating system and fully integrated with the network file system—all of this enabling a distributed computing environment.

According to Microsoft, Cairo (the next version of Windows NT and NT Server, under development) will be the first system to use the new directories.—Bert V. Jensen



MIGRATING TO WINDOWS NT: You select the servers that migrate and create a file to specify how information is transferred.

3.12 servers to existing NetWare clients, and Directory Services for NetWare, which lets you manage NetWare 3.x servers directly from Windows NT (see the sidebar "Microsoft: Tools to Smooth the Upgrade" for a preview of these two products).

The threat from Microsoft is sure to steal some NetWare 3.x customers, but Novell isn't standing still. Later this year, Novell will introduce a version of NetWare 4.1 that will incorporate SMP. While traditional file and print servers rarely need the extra horsepower of multiple processors, NetWare 4.1 SMP will help foster a migration path for the large installed base of customers who use NetWare 3.x as a database platform.

Prospective buyers should note, however, that 4.1 SMP will not be a replacement for 4.1. Although pricing has not been announced, Novell will still push non-SMP 4.1 for the majority of its server sales.

Although adding SMP hooks should make NetWare more scalable, it still doesn't address some of the other common problems traditionally seen with NetWare, especially in the area of application development. To address those areas, Novell is pushing its other major OS, UnixWare, as its recommended platform for developing scalable client/server applications.

UnixWare is an Intel-based Unix operating system which came out of Novell's acquisition of Unix System Laboratories (USL) in 1993. During testing for our review of UnixWare in this issue, we found it both fast and easy to manage (see "Serving Up Apps").

But for UnixWare to fit more cleanly into Novell's long-term plans, it needs to have tighter integration with NetWare. Novell has announced plans to port NDS to UnixWare as part of its next major release, but plans beyond that remain sketchy. The term *SuperNOS*, which at one time referred to a unified UnixWare/NetWare operating system on a single box, is no longer used by Novell. In addition, firm details for Novell's long-term integration plans have not yet been outlined.

MOVING FORWARD

If you do decide to migrate to NetWare 4.1, the most sensible advice you can follow is to plan ahead. NetWare 4.1 is a major upgrade from earlier versions, so you can't expect an army of 3.12-trained administrators to come through your door and move your network to 4.1 overnight.

The actual process of moving servers

from 3.x to 4.1 is fairly easy, but planning your NDS hierarchy probably won't be. Although NetWare 3.12 administrators will feel comfortable with many facets of NetWare 4.1, the move from traditional server-based utilities such as Syscon to NDS-based tools such as NWAdmin is a major conceptual change. If you plan your

Moving servers from 3.x to 4.1 is easy, but planning your NDS hierarchy won't be. The move from server-based utilities to NDS-based tools is a major change.

NDS hierarchy correctly the first time, it will be easier to add new servers and users later on. But a poorly-planned hierarchy can lead to problems later.

The good news, however, is that the tools in NetWare 4.1 are excellent. NWAdmin is more powerful, more logically organized, and easier to use than its 3.12 counterpart, Syscon. NWAdmin lets you easily browse all the objects in your NDS tree, and you can view and edit properties of any object in your global hierarchy with just a few mouse clicks.

In addition to NWAdmin, third-party tools such as DS Standard from Preferred Systems (800-222-7638, 203-937-3000) and

What's New in 4.1

Global naming service	NetWare Directory Service (NDS) is the most significant feature upgrade with NetWare 4.1. It gives administrators a centralized view of all resources on their global networks. Users need to login only once for all servers.
Improved installation	An improved network configuration utility and integrated CD-ROM support highlight a vastly improved installation procedure over 3.12.
Improved administration tools	NWAdmin provides a graphical way to manage your NetWare network centrally.
Disk optimizations	4.1 helps you conserve disk space by compressing files on the fly and by suballocating disk blocks to let multiple files access a single block.
Better routing	NetWare 4.1 includes NetWare Link State Protocol (NLSP), an improved routing protocol, which eliminates the RIP/SAP traffic on your network. New modules from router vendors will make NLSP increasingly desirable.

the REXXWare Migration Toolkit from SimWare (800-267-9991, 613-727-1779) are also available. These products let you manipulate your NDS tree off-line, so that you can move and search through your NDS objects without worrying about corrupting your global NDS database.

Novell also provides a utility with 4.1 called NetSync to help you manage integrated 3.x/4.x server environments. NetSync lets you manage as many as 12 3.x servers for every 4.1 server, using standard 4.1 management tools (such as NWAdmin). NetSync loads as an NLM on your 4.1 server and on each 3.x server you want to manage. These NLMs synchronize information changes from your 4.1 server back to each managed 3.x server.

Finally, don't forget about upgrading the software on all your network clients. In most cases, that will be the most difficult part of the migration. For DOS/Windows clients, older Netx requester software will still be able to login to NetWare 4.1 servers, but it can't take full advantage of NDS. You'll need to install the newer Virtual Loadable Module (VLM) software that comes with 4.1 to allow your clients to login to the NDS tree.

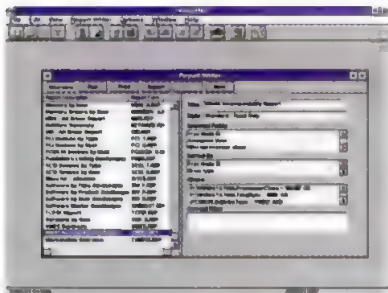
NDS-aware versions of client software are also available for Macintosh and OS/2, and Novell recently shipped an NDS client for Windows NT Workstation. In the near future, however, Novell will release new client software based on a separate 32-bit architecture called the NetWare I/O subsystem (NIOS). According to Novell, this new architecture will be more extensible and more portable than VLM's. Versions for DOS/Windows—and for Microsoft Windows 95—are due out in November of this year. □

How do you find out if your users' hardware configuration is **Win '95 compatible?**



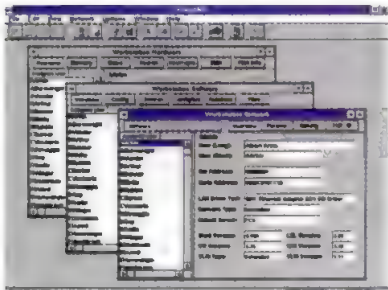
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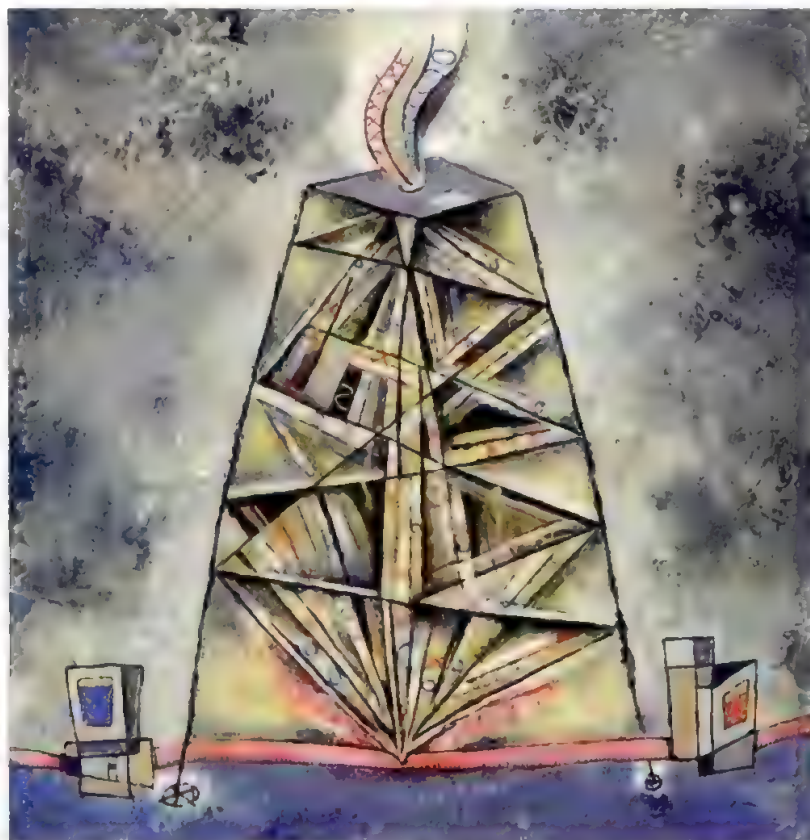
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PROTOCOL ANALYZERS

Gettin' Down

The only way you can really understand your network is to get inside the wire and become familiar with protocol traffic.



By Robert P. Lipschutz

In the light of day, the network performs its duties with few people taking notice. Files get delivered to the appropriate users, print jobs run silently (and endlessly) in the background, and folks send and receive all those e-mail messages so important to business.

While the network is running smoothly, everyone thinks the network manager is great. But when something causes the network to slow down or fail, everyone goes running to find out what the problem is and when it will be fixed.

How can you, the network manager, know what went wrong or even begin to understand? Well, like all good network

managers you maintain a toolkit—a bag of tricks—for troubleshooting your valuable network. One of those tools should be a protocol analyzer.

In this article, we look at three such products—Network General's Expert Sniffer Analyzer, Notebook Version 4.52; Novell's LANalyzer for Windows 2.1; and Triticom's LANdecoder/e 2.10.

DOING THE DIRTY WORK

Protocol analyzers reveal the inner workings of a network—the raw packets of data that make up the file requests and print commands and e-mail that travel across the wire from client to server, computer to computer. You might think

that only a network scientist could decipher this low-level information. But with a little practice you'll find that this information can be approachable. And it becomes more useful as your understanding of network protocols increases.

In fact, these products show you more than just the esoteric binary 1s and 0s and hexadecimal equivalents of bits traveling the network. They decode and analyze network packets at a higher level, and they also provide the tools for you to delve deeper as the problem dictates.

How do you use a protocol analyzer to solve a problem? Take, for example, the case of a router. Many networks use routers for wide-area links. Suppose a user is having trouble getting through from the San Francisco office to the New York office over the network.

One thing you could do right away is set up the protocol analyzer and see if the West Coast router still "exists" on the network. If it does, it would still be broadcasting RIP (Routing Information Protocol) packets, which the protocol analyzer would reveal. You would use the information you discover to take the next step: Go fix the router or remove it. You have to know what you're doing, but your comfort level will increase the more you use the analyzer.

PACKETS, PACKETS EVERYWHERE

Simply put, network packets are bursts of electrical voltage organized into discrete packages governed by a myriad of network protocols. Each protocol works a little differently, and the job of protocol analyzers is to decode the packets into plain English. Unbeknownst to network users, these little packets of data (from 64 to 1,518 bytes long for Ethernet) are constantly traversing the network wire.

Roughly speaking, packets can be broken into two types: user data and network overhead. User-data packets carry the files and print jobs that travel across the wire. When you open a 100K file from the file server, the file is delivered to your client PC contained in about 100 small packets. These packets contain mostly sequenced parts of your file, but they also contain some network-overhead information. For example, a packet always has source and destination addresses, so it knows where it's going and where it came from.

Some packets are dedicated to network overhead. For example, NetWare servers use Service Advertising Protocol (SAP) packets to broadcast their file and print services. Routers use routing information

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protocols such as RIP, OSPF, RTMP, and NLSP to communicate with other routers. With a protocol analyzer, you can decipher user-data and network-overhead packets to tell the story of the network.

MAGIC WANDS

The three Ethernet protocol analyzers we tested represent the low and middle portions of the market. Sniffer, LANalyzer, and LANdecoder/e all come in the form of software that you install on a dedicated notebook or desktop PC. (In a test lab, you may want the more powerful, more expensive products from Hewlett-Packard, Tekelec, and W&G.)

Sniffer has been the de facto standard for many years. Originally marketed as a hardware/software bundle, it is now packaged as an adapter-and-software kit that works with a number of popular notebook computers.

LANalyzer grew up as a lower-cost, easier-to-use alternative and makes good on that claim today. Its Windows interface and powerful decoding, including NetWare 4.1 packets, earned it the nod as our Editors' Choice. For a real bargain, LANdecoder/e provides capturing and decoding of a surprising number of protocols for under \$1,000.

THE RIGHT WAND

A protocol analyzer must be both powerful and approachable. If it has all the answers but you are left with none, the tool hasn't worked. You shouldn't have to be a genius to use it. That is, after all, why you use the tool in the first place.

We evaluated these products both in our labs and on our production networks. Our production network provides a diverse set of platforms including Lotus Notes; Microsoft Windows NT, Windows for Workgroups, and Windows 95; NetWare; and OS/2.

First, we evaluated the "expert" quality of each product; that is, its ability to diagnose problems on the network independently and intelligently. These problems include broadcast storms, duplicate IP addresses, and slow servers.

Two of the products offer an expert mode. This mode in Sniffer finds what it calls Symptoms and Diagnoses, while LANalyzer has a Dashboard screen that shows errors on the network, servers, and routers. LANdecoder/e has no expert mode but does make high-level analysis straightforward.

Not satisfied with just the expert view, we dove into the heart of these products—packet capture and protocol decodes. We counted the number of included network

LANalyzer for Windows

It's both powerful and easy to use, fulfilling our two most important criteria for a network protocol analyzer. And LANalyzer for Windows is

naturally cozy with the NetWare protocols: The product includes the latest NetWare 4.1 drivers as well as the full suite of previous NetWare protocols, plus TCP/IP and AppleTalk. This makes for a complete, up-to-date package.

LANalyzer's packet capture and decode just make sense, and its filtering is by far the best of the lot. Because the product is easier and more approachable than the others here, we also think you'll use the powerful features of LANalyzer more often.

Expert Sniffer Analyzer decodes the most protocols of the bunch, but it can

be tricky to use and it's quite expensive. In addition, with its DOS-based nested menus, you'll need to learn where different options are located before you can effectively use Sniffer as a tool.

Once you're through the learning curve, though, Sniffer is the most powerful analyzer reviewed here.

LANdecoder/e has an alluring price and a full set of protocol decodes. We had a few installation problems because of its huge memory requirement. We also found the filtering a bit difficult to use. But if you're on a really tight budget, it's a keeper.



protocols and evaluated both the depth and breadth of support. For example, Sniffer works with a large number of protocols and handles nearly all packet flavors fully. Interestingly, it does not yet decode NetWare 4.1 packets.

LANalyzer does not handle as large a number of protocols, but it does decode NetWare 4.1 NDS and NLSP packets. We were surprised at the number of protocols recognized by LANdecoder/e, making it a diverse tool for consultants. We used the captures and decodes to view burst copies, frame-type mismatches, print-server broadcasts, and other network traffic.

We also poked around each user interface, using the product as we expect you would. We tried to customize, change, alter, and control the view to provide the most information. Because these analyzers capture large amounts of information, you need help in breaking the data down. Overall, this was a weak point with the products.

We looked at filtering capabilities, both for capturing and for displaying information. Capture filters block out unwanted packets, so valuable buffer space can be used for packets of interest. Display filters further hone the view so network administrators can focus on only those packets of interest. LANalyzer's filters in particular were quick and easy to use.

Finally, we assessed printing and report generation. We tried to print out both summary and detailed views of our packets. Although each product provides an expert

utility, we would much prefer better report-generation tools built into each product.

In addition, we tried out the network-monitoring and traffic-generation tools. Network monitoring gives an overall view of utilization and errors on the network, while traffic generation is most useful in testing labs.

Protocol analyzers are a good investment and worth learning how to use. The time you spend learning about the core network packets will make future troubleshooting much more fruitful.

Network General Corp.

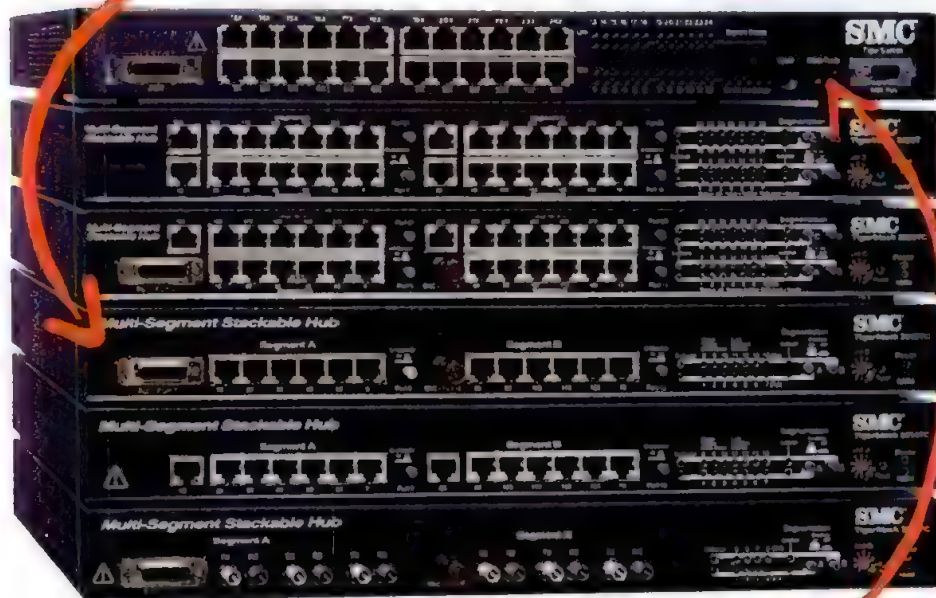
Expert Sniffer Analyzer

We say "Xerox" when we mean photocopy and "Kleenex" when we want a facial tissue. When network managers want to use a protocol decoder/analyzer on their networks, they often say, "Let's put a Sniffer on it." Network General has been shipping Sniffer in some form since 1988. With its full suite of protocols and complete set of filtering options, this Sniffer, like the others in the company's line, deserves to be thought of as synonymous with the protocol decoding/analyzing function.

Expert Sniffer Analyzer is not, however, easy to use, and although experienced users have come to accept its nested menuing system, first-timers will clamor for an update. Network General offers several versions; we tested the midrange model.

Installation was quick. We loaded the

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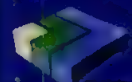


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SNIFFER'S DOS-BASED INTERFACE gives you access to a wealth of information about your network packets.

included software and PC Card Ethernet adapter on a Toshiba 1950CT notebook. We didn't need any additional PC Card or network software.

The first thing you'll notice when you start up the protocol-analyzer portion of the software is the Expert screen. Added a few years back, the screen is an attempt to make Sniffer more approachable. It discovers and displays symptoms and diagnoses—including duplicate IP addresses and broadcast storms—while the program is busy capturing packets. You can get an explanation of any diagnosis by using the explain function key (F1).

The expert overview is useful if you need information at a glance, but for substantive feedback you must look to the heart of the program, the protocol decoder. Sniffer's suite includes all NetWare protocols (except, surprisingly, that for NetWare 4.1), as well as the Microsoft and IBM SMB and NetBEUI protocols, the entire TCP/IP suite, AppleTalk, VINES IP, DECnet, XNS, SNA, and the ISO standards. Network General says software for NetWare 4.1-related protocols will ship in 1996.

The data captured by the DOS-based Sniffer isn't highly customizable. You can't sort network stations by traffic, and you can't set filters by pointing to a reference packet, as you can with LANalyzer. The program does use color to help organize packets by protocol type and layers, but the data manipulation tools that Sniffer really needs will be available only if and when the product moves to a GUI-based OS.

Sniffer's capture and display filtering tools are very powerful and flexible, letting you produce any combination of filters you want. The package also provides the best network monitoring and traffic generation of any product included in this review.

The network monitor runs as a separate module and is useful for assessing your network's general health and traffic load. It displays network utilization and packet

sizes in numeric or graphics form, and can monitor either the entire network or selected computers.

The included traffic-generation tool can be used to test network devices; frames can be edited and sent singly or in large bunches. This feature is most useful in a development environment where there is no danger of destroying a production network.

This Sniffer's print and report capabilities are in keeping with its other features: They're powerful but not easy to use. But you can export information into CSV format, and you can print frames or sequences of frames in summary, detail, and hex.

Expert Sniffer is a top-of-the-line product best suited for network veterans. The full Sniffer line also includes Sniffer Lite for NetWare, a scaled-down version.

Expert Sniffer Analyzer, Notebook Version 4.52.

List price: \$9,995. Also available in Token-Ring, FDDI, and Internetwork versions. Network General Corp., Menlo Park, CA; 800-764-3337, 415-473-2000; Web, <http://www.ngc.com>.

Circle 952 on reader service card

Novell Inc.

LANalyzer for Windows



Catering to the NetWare administrator, LANalyzer for Windows is an easy-to-use tool that decodes the three basic LAN protocols—IPX, TCP/IP, and AppleTalk. And it's the only one here that includes the full suite of NetWare 4.1 packets. Though it

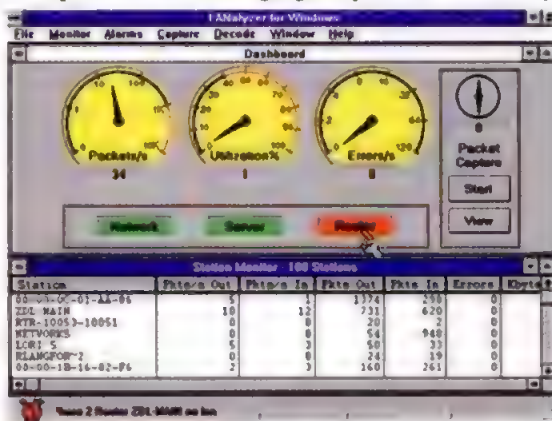
lacks Expert Sniffer Analyzer's breadth of protocols and options, it is much easier to use, and the price is right.

This Windows-based package greets you with odometer-like dials. Appropriately called Dashboard, this screen provides basic utilization and error statistics and reports any errors encountered with the network, server, or routers. The diagnoses are not as comprehensive as Sniffer's, though—

offering no "duplicate IP address" alarm, for example. But they can provide some high-level alarms about the network.

As with the other products here, LANalyzer's real power is in its decoding. It decodes NFS and SNA packets in addition to the core protocols. Heterogeneous networks may need Triticom's add-on DecodesPlus 1.1 (\$495), which extends LANalyzer's suite to include SMB/NetBEUI, VINES IP, and DECnet Phase IV.

Summary, decode, and hex dump views of the packets appear in three horizontal windows. As you traverse the summary screen, the windows below synchronize to show the highlighted packet. The summary



LANALYZER'S DASHBOARD has one of the most appealing "expert views" we've seen in a protocol analyzer.

screen does a nice job of showing columns with packet source and destination addresses, layer, size, description, and time.

For NetWare clients, the summary screen will show log-on names instead of the sometimes nonsensical station MACs. You simply have to run a quick scanning program every so often.

LANalyzer has the most approachable filtering tool here, with easy-to-use capture and display filters. And unlike Sniffer's and LANdecoder's, LANalyzer's display filters can be invoked by pointing and clicking on a desired portion of a packet in either the protocol decode view or the actual hex. It's easy to double-click on, say, the SAP portion of a desired packet, then watch as LANalyzer filters on this specific packet type.

It doesn't, however, have the ability both to include and to exclude multiple packet filters, an area in which Sniffer excels. This is a typical power-versus-ease-of-use scenario. LANalyzer wins on ease of use.

LANalyzer's station monitor shows any device that has a NIC and is alive, including servers, client PCs, and routers. You can sort stations by name, packets sent,

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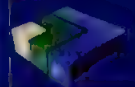
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NETWORK EDITION

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and errors, which is useful for diagnostics.

Novell also offers the LANalyzer probe for servers, which comes with ManageWise. With this, the LANalyzer console can view data transcending any server with a ManageWise agent.

Though LANalyzer is easy to use and highly informative, at times we wished for more powerful filtering capability in order to view some very specific subset of network packets. All in all, it's a great tool for the network administrator.

LANalyzer for Windows 2.1. List price: \$1,495. Novell Inc., Provo, UT; 800-638-9273; 801-429-5533; Web, <http://www.novell.com>.

Circle 955 on reader service card

Triticom

LANdecoder/e

At \$945, Triticom's LANdecoder/e, Version 2.10, is a bargain. It decodes a surprisingly large number of protocols, and it's also relatively easy to use—once you get past the installation and learn the DOS-based commands. This isn't just another low-end protocol analyzer.

LANdecoder/e looks harmless enough on arrival—a single disk with only five files. Still, we had difficulty installing LANdecoder/e using an ODI stack with either a PC Card or an ISA Ethernet adapter, principally because of the program's voracious appetite for convention-

you started. As packets are captured, multiple views help you find problems.

The main view shows packets by station pair, and the pairs can be sorted by ID (using function key F3) or by the number of packets (F4). Other views show utilization, frame count, and errors, in numeric or chart format. One screen shows a graph of packet size distribution, so you can tell if small or large packets dominate your network.

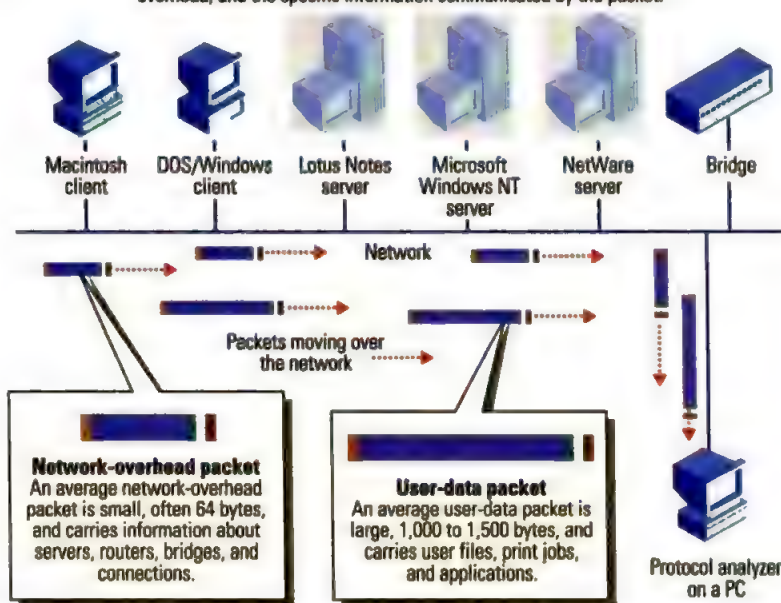
The protocol decode screen incorporates summary, detail, and hex views. Color helps separate the different layers of individual packets, and a toggle switch runs you through the packet layers. You can add a station name for each MAC address to make packet identification easier.

LANdecoder/e decodes quite a large number of protocols. In addition to IPX, TCP/IP, and AppleTalk, it reads SMB/NetBEUI, VINES IP, and DECnet packets—unlike Novell's LANalyzer. But LANdecoder/e doesn't yet decode NetWare 4.1 packets.

This feature cuts both ways, though: The sheer volume of information provided on your screen can be overwhelming.

Packet Explorations

All packets contain destination and source MAC addresses. A protocol analyzer can dig deeper into each packet to tell you the network protocol type, whether the packet contains user data or network overhead, and the specific information communicated by the packet.



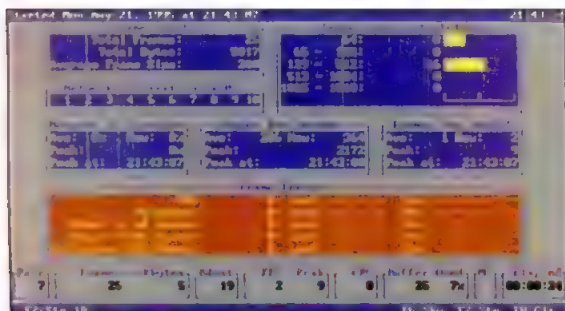
The capture and display filters do help isolate the wheat from the chaff, but all capture filters except station address must be entered using pattern matching. This requires you to input packet code manually, which works fine but can be intimidating. By contrast, both Sniffer and LANalyzer provide pick lists as well as pattern matching. You get a bit more flexibility when you use LANdecoder/e's display filters, since they let you select specific protocols.

Like the other products here, LANdecoder/e lets you use capture triggers—either pattern matches or station names—to determine when packets are captured. It also includes a traffic generator, whereby a set number of defined data frames can be sent to a given MAC address on the network.

LANdecoder/e's low price tag makes it a good tool for a small network site. But its sticky install and use of pattern matching for filtering might make it more appropriate for a test lab. Still, at this price there's no better way to access one of the most informative top-level network views on the market.

LANdecoder/e, Version 2.10. List price: \$945. Also available in Token-Ring and ARCnet versions. Triticom, Eden Prairie, MN; 612-937-0772; Web, <http://www.triticom.com>.

Circle 951 on reader service card



TRITICOM'S LANDECODER/E features multiple windows, which give you a great top-level view of your network.

al memory (576K). We eventually used an Eagle NE2000 adapter, which works natively with LANdecoder/e's software.

We suggest that you also use one of the supported adapters to avoid fighting the memory battle. Version 3.0, which should be shipping by the time you read this, will feature memory enhancements.

Once you're up and running, the DOS-based user interface is easy to use, if you're comfortable with function keys. Choosing Capture Traffic from the main menu gets

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First Looks

HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

SMTP MAIL SERVERS

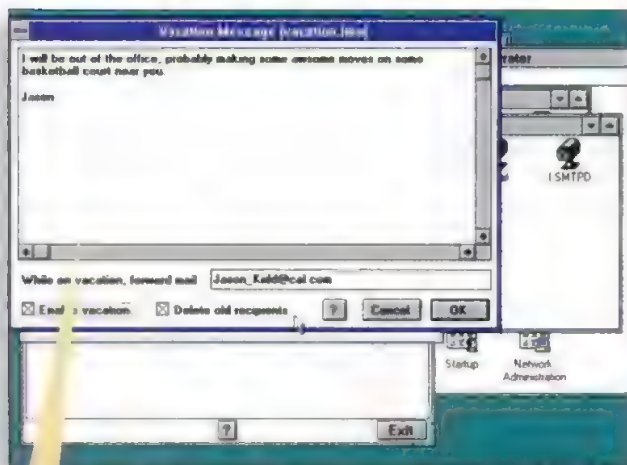
Internet Mail Made Easier

By O. Ryan Tabibian

The World-Wide Web is usually the first thing people think of when they consider setting up Internet access, but e-mail is still the Internet application most users really

two products do not compete directly, we feel that IMail Server provides a wider range of features at a much lower price, though Nov*ix Mail Server is still a good choice for NetWare sites.

IMail Server for Windows NT



"I WILL NOT BE CHECKING E-MAIL": IMail Server lets you generate automated responses to e-mail messages received while you're out of the office.

need. Until now, however, it wasn't easy to set up an Internet e-mail server without a healthy knowledge of Unix or a proprietary gateway add-on for your LAN-based e-mail package.

In this review, we look at two new products that challenge this notion: Ipswitch's IMail Server for Windows NT, and Firefox's Nov*ix Mail Server Version 2.3 (for NetWare). Both products let you turn a network server into a Simple Mail Transfer Protocol (SMTP) server, providing Internet e-mail access to your Microsoft Windows NT or NetWare clients. Although the

Ipswitch Inc.

IMail Server for Windows NT

Microsoft Windows NT is steadily gaining momentum as a viable Internet server platform. With the existence of so many Windows NT Internet tools for Usenet news, Gopher, and Web servers, the addition of IMail Server is like icing on the cake.

IMail Server (\$695, including an unlimited user license) is the first member of Ipswitch's CyberServer family, which will soon include news, Web, and Domain Name Service (DNS) servers. With a broad array of

easy-to-use features and an easy setup process, IMail Server is tough to beat as a Windows NT-based SMTP server package for under \$700.

We had no difficulty at all setting up IMail Server. Once we had it installed, we were impressed by the product's range of features. IMail Server not only offers basic SMTP server features, such as e-mail access to any POP3 mail client for Macintosh, Windows, or Unix, as well as mail forwarding and queue management, but also includes a variety of other tools, such as finger and WHOIS server functions.

When it comes to management, IMail Server provides a couple of options. The primary management tool is a convenient control panel applet. From this panel, you can stop and start any service on the IMail server and edit your

SMTP setup information. During our tests, however, we encountered a bug in the installation routine that did not correctly copy the control panel applet to our hard disk. Ipswitch is aware of this problem and should have it fixed by the time you read this.

There is also an intuitive and powerful user management application that allows you to add and delete users, set passwords, and create forwarding addresses, among other features. Unfortunately, IMail Server cannot automatically import users from the Windows NT domain. This feature, however, should also be available by the time you read this.

Since IMail Server runs as a Windows NT Service, you can manage your SMTP server (or servers) via Windows NT's built-in remote-management tools.

Continues on page NE40

LOTUS NOTES UTILITIES

Lotus's Much-Needed Management

By Tony Pompili

Lotus Notes is a powerful and popular workgroup application. The problem, as the administrator of any large Notes site will tell you, is that there has never been a good way to manage multiple Notes servers from a single location. Until now, that is.

With the release of NotesView, Lotus Development Corp. has finally answered the need for a centralized, comprehensive management application for Notes. Based on Hewlett-Packard's HP OpenView 7.2 management platform, NotesView utilizes a combination of SNMP polling, mail routing tools, and Notes API remote data-gathering tools to present a unified view

of your Notes network. Because it runs over OpenView, NotesView provides a rich, easy-to-use graphical interface.

With NotesView, you can pinpoint and configure specific Notes servers, monitor server information (such as available disk space), or even receive SNMP alerts of failed system components before problems get further out of hand—all from a single Microsoft Windows-based PC. In other words, NotesView could be a Notes administrator's dream come true.

Like any management product, NotesView may seem a bit pricey. The product is priced according to how many Notes servers you have. For example, if you have 40 or fewer servers,

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NotesView costs \$3,500, while it costs \$6,000 for 41 to 150 servers. Of course, you do have to add in \$1,495 for the HP OpenView for Windows software. Considering the wealth of management features that NotesView provides, the pricing is actually pretty reasonable.

Unfortunately, NotesView was available only for Windows at the time of this review. But by the end of 1995, Lotus hopes to have a Unix version on the market as well. This is good news for the many Notes sites already running HP OpenView for Unix instead of the Windows version.

A MIXTURE OF MANAGEMENT METHODS

NotesView uses some familiar Notes features and adds some SNMP functionality to provide a well-rounded management utility. For example, NotesView automatically gathers statistics that can be collected manually via Notes 3.x's remote-console feature. Also, NotesView uses existing Notes 3.x report and event processes to gather and send these statistics to the management PC.

The heart of the product is the NotesView poller, which uses existing Notes API calls to collect server statistics. You can set the poller to gather statistics immediately or on a scheduled basis. You could use the poller, for example, to see how well a server is routing mail or how much disk space is available on each server.

Many of NotesView's advanced management features are based on SNMP, which, among other things, allows the Notes administrator to shut down or boot up a Notes server. In order to use SNMP with NotesView, though, you must make sure that you first install the NotesView SNMP agent on each server you want to manage. This can all be a bit of a pain, especially if your Notes servers are located at various sites around the world.

Also, the SNMP agent re-

quires TCP/IP, so all managed servers using SNMP must be running that protocol. Fortunately for those Notes users who want to use NotesView's basic feature set, SNMP is optional. Since the majority of Notes servers are more likely to be running NetBIOS or IPX/SPX, the TCP/IP requirement may deter some potential NotesView users.

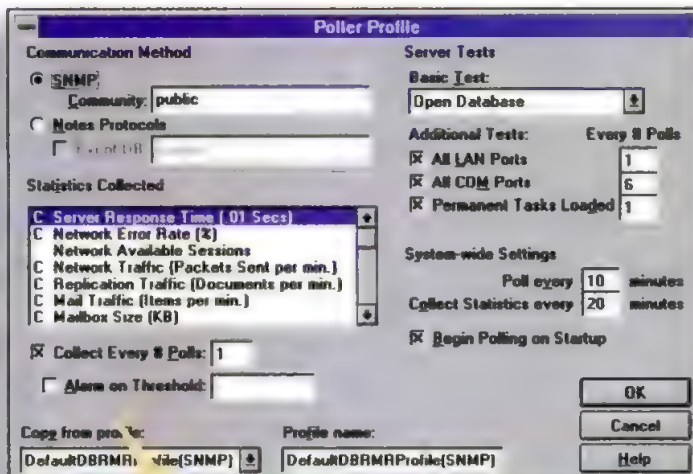
Still, SNMP offers a host of powerful management features, such as the ability to generate alerts to the NotesView station, rather than waiting for the NotesView station to poll each server. This sort of proactive management would be especially helpful for sites with Notes servers configured to receive live feeds, such as news feeds.

Taking advantage of the graphical look of OpenView, NotesView lets you map out your Notes servers and monitor replication, routing, and network connections. During our tests, we soon discovered that a 17- or 19-inch monitor is best for checking these maps. On a smaller screen,

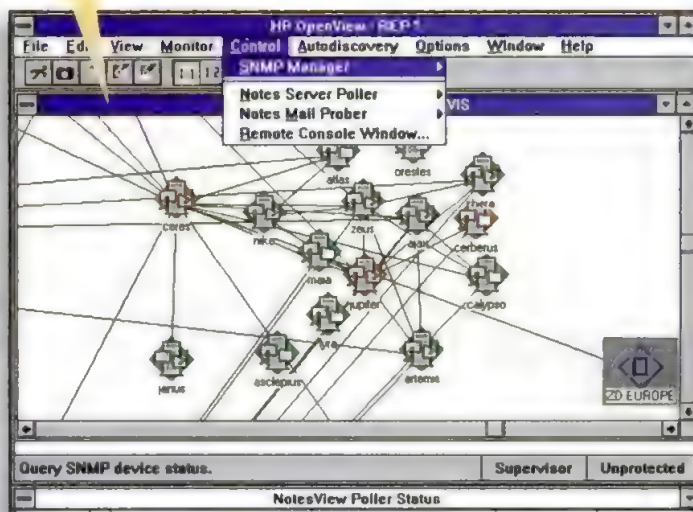
our 70-server network map quickly became cluttered and unreadable. It was impossible to see the entire network and still be able to identify individual servers.

NotesView creates your initial list of servers and server data by parsing the Notes Names and Address book. This process, called Autodiscovery, uses Server, Connection, and Networking information to build the initial group of servers. It then polls each of these servers for up-

NotesView 1.0



IMPRESSIVE FEATURE SET: You can configure NotesView to gather a wide variety of information and statistics on your Notes servers. You can also view maps of your server setup, but they can easily appear cluttered on a small monitor.



to-date information, which is good because the Names and Address book can contain old data that is no longer valid. Each server can be polled differently depending on its use. For example, if a server isn't running the SNMP agent, you can turn off SNMP polling for that server.

One thing that you should keep in mind when you're using NotesView: If you're planning on testing COM1, NetBIOS, or IP server ports, you'll have to run the appropriate protocol on

the NotesView management station (Notes XPC would be the protocol for COM1). This can cause some memory problems on the NotesView station, although you won't have to worry about AppleTalk, because NotesView does not monitor that protocol.

NotesView 1.0. List price: For up to 40 servers, \$3,500; for up to 150 users, \$6,000; Lotus Development Corp., Cambridge, MA; 800-346-1305; 617-577-8500; Web, <http://www.lotus.com>.

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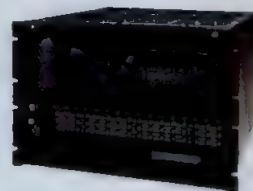
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NETWORK EDITION

First Looks

SMTP Mail Servers

Continued from page NE37

One very handy feature of IMail Server is the vacation option, which allows users to set up automatic replies for any e-mail received while they're out of the office.

IMail Server for Windows NT.

List price: \$695 (unlimited users). Ipswitch Inc., Lexington, MA; 617-676-5700; fax, 617-676-5710; Web, <http://www.ipswitch.com>.

Circle 953 on reader service card

Firefox

Nov*ix Mail Server

Windows NT may be gaining popularity as an Internet platform, but NetWare still holds sway in the LAN market. Because of this, the need for NetWare-to-Internet connectivity products is significant, to say the least. Nov*ix Mail Server is just the latest in the impressive Nov*ix line by Firefox, makers of our Editors' Choice for IP/IPX Internet gateways

("Hassle-Free Internet," Network Edition, July 1995).

Nov*ix Mail Server, like the rest of the Nov*ix family, eliminates the need to load TCP/IP on the client. Instead, Nov*ix Mail Server provides IPX-to-IP translation on the server, so that clients need only run a single protocol.

Nov*ix Mail Server consists of two parts: the core NLM, which handles the IPX-to-IP translation, and the SMTP server software. You can use any POP3 mail client to access mail via Nov*ix Mail Server.

Installing and configuring Nov*ix Mail Server required a bit of patience, primarily because of poor documentation and an unintuitive installation procedure. For example, while most of the installation process is automated, we still had to edit some configuration files manually. Additionally, Nov*ix Mail Server did not automatically load the necessary NLMs to start the mail server.

Nov*ix Mail Server does

Nov*ix Mail Server Version 2.3

Central Mail Configuration

Pop Host Name or IP Address: 204.178.224.70

SMTP Host Name or IP: 204.178.224.50

Poll Time (mins): 1

Receive Protocol: Pop3

Local Domain: pcmag.com

Root Directory Path: N:\SYSTEM\NOVDX\MAIL

OK Cancel

MIXED BAG: Plugging basic configuration into Nov*ix Mail is easy, but other portions of the installation options are more difficult.

provide some good management features through two basic utilities. The first is a Microsoft Windows-based application called FFADMIN that lets you set the POP host name, choose protocols, and configure the local domain and root directory for the mail file. The other management

tool is MCONSOLE, which lets you set time-out parameters, default routes, and other user configuration settings. One setting, "junk mail ignore," lets you send an automatic reply to specific users or domains.

Nov*ix Mail Server Version 2.3. List price: For 5 users, \$1,050; for 25 users, \$3,550; other license options available. Firefox, San Jose, CA; 408-467-1100; fax, 408-467-1105. Circle 954 on reader service card

REMOTE ACCESS SERVERS

A Fresh Face in the Remote Crowd

By Steve Rigney

It's not easy to set yourself apart from the crowd in the remote-access server market. After all, nearly 30 vendors crowd that segment of the market now, and more are joining in every day. But modem giant U.S. Robotics is determined to carve a niche for itself, and its NETServer/8 and NETServer/16 models might be just the products to make that happen.

These new remote-access servers provide an array of features, such as remote-node dial-in capabilities and LAN-to-LAN routing, plus built-in V.34 modems and an impressive aggregate bandwidth feature. Unfortunately, the NETServers do not support dial-out capabilities for IPX clients and can be difficult to set up for

Unix novices.

The NETServer/8 (\$7,995) and NETServer/16 (\$11,995) are best suited for networks running the TCP/IP protocol,

and are great platforms for establishing dial-up, LAN-to-LAN routing connections.

Physically, the NETServer is a sturdy, impressive, and very sleek box. The rack-mountable black chassis is about the size of a desktop PC. A series of LEDs on the front of the unit provides



SLEEK, SLICK SERVERS: The NetServer/8 and NetServer/16 are fairly well-rounded remote-access servers that provide a unique method for boosting LAN-to-LAN routing performance.

useful information, such as individual port status and network transmit and receive activity. The NETServer offers both 10Base-T and BNC network connections as well as a serial port for a direct terminal connection.

The hardware is fairly easy to install, certainly no more difficult than installing similar products like the Shiva LAN-Rover/Plus and the Microcom LANExpress. That all changes once you proceed to the software portion of the installation process, however.

Before you can start using the NETServer for remote-node dial-in connections and LAN-to-LAN routing, you have to connect a terminal (or a PC running a terminal emulation program) to the unit's serial port in order to configure the server. From the terminal, you must set the server's IP address, netmask, and user names and passwords

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NETWORK EDITION

First Looks

for management rights. If you use IPX on your network, you'll also have to provide the unit with the IPX cable number and the type of Ethernet frame used on your network. This isn't rocket science; it's just a bit cumbersome and un-intuitive.

After you set up all of your protocols, security, and frame types, you can tackle the process of setting up the user accounts and configuring the modem ports. For this, you have two options: You can either use the included Windows-based Configuration Manager software, or you can use the same terminal connection from the previous set of tasks. Unless you are proficient with the Unix command line, you'll probably be more comfortable with the Configuration Manager. This intuitive utility allows you to set up all of your user information, security, and network filters. For example, you can configure the NETServer so that users can dial in only during certain hours, using a particular protocol; you can also restrict their access to certain servers. In addition, you can configure each user's IP address or assign each user a random address for each new connection. The Shiva LANRover Plus provides similar controls but does not allow you to set up as many network filters.

GREAT FOR LAN-TO-LAN LINKS

In practice, the NETServer borrows a trick from ISDN routers to increase throughput over LAN-to-LAN links. Specifically, you can combine all of the analog ports on the NETServer into one fat pipe for remote-LAN links. This means that the 16-port model can provide almost 2 megabits per second (Mbps) of bandwidth over a dial-up connection. Additionally, the NETServer will automatically dial a remote site when it receives data intended for that site.

Most of the NETServer's competitors do not allow you to aggregate the bandwidth and typically require that you manually initiate a remote-site dial-up connection.

While the NETServer provides dial-out capabilities to IP networks, it does not offer the same capabilities to IPX networks. This is one of the product's only shortcomings. Dial-out allows users to share the pool of modems in the remote access server so that each user does not need to have a separate modem, PBX connection, and data line.

For dial-in connections, remote users can access the NETServer from any DOS or Windows PC using either IP or IPX. Like the LANExpress and LANRover Plus, the NETServer includes client software that works with both Novell's NETX and Virtual Loadable Module (VLM) client redirectors, allowing you to establish multiple dial-in connections without rebooting your computer each time. Basically, this makes it easy for the network administrator to set up users' laptop units for both local and remote network connections.

Another useful feature of the NETServer client software is its ability to generate all of your client installation disks from a single PC. Like Attachmate's Remote LAN Node, the NETServer software lets you create individual client disks based on the type of network protocol and network

NETServer Configuration Manager

NETServer Configuration Manager - User Table Configuration

File Tables Statistics View Window Help

Network User Parameters

Name: Steve Password

Type: ☐ User Login ☒ Normal ☐ Dialback

IP Address: ☐ Assigned ☒ Negotiated ☐ Specified

Input Filter: Output Filter: Protocol: PPP/IP/IPX Netmask: 255.255.255.0

Routing: Broadcast & Listen Location: IPX Network: 995 MTU: 1500 Compression: R

OK Cancel Default Help

MULTIMODEM MANAGEMENT: The NETServer provides a good set of management tools, which range from basic user account setup to port monitoring.

NETServer Configuration Manager - Port Configuration

File Tables Statistics View Window Help

Ports	User Login	Host Device	Network	Host Type	Primary Host
Port 0	Enabled	Disabled	Dial In	Default	0.0.0.0
Port 1	Enabled	Disabled	Dial In	Default	0.0.0.0
Port 2	Enabled	Disabled	Dial In	Default	0.0.0.0
Port 3	Enabled	Disabled	Dial In	Default	0.0.0.0
Port 4	Enabled	Disabled	Dial In	Default	0.0.0.0
Port 5	Enabled	Disabled	Dial In	Default	0.0.0.0
Port 6	Enabled	Disabled	Dial In	Default	0.0.0.0
Port 7	Enabled	Disabled	Dial In	Default	0.0.0.0

Save Reset Copy Paste Default Print Exit Help

access you want the user to have.

Finally, the NETServer offers decent management features, though nothing out of the ordinary. Like the LANRover Plus, the NETServer includes a built-in SNMP hardware agent and you can use an SNMP management console, such as Hewlett-Packard's HP OpenView, to monitor the status of all your

NETServers from a single location. You can also use the Configuration Manager to control multiple NETServers from a single location, but you'll only be able to monitor a single server at a time.

NETServer/8. List price: \$7,995. **NETServer/16.** List price: \$11,995. U.S. Robotics Inc., Skokie, IL; 708-982-5010; fax, 708-933-5800.

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NFS Client Included	YES (VxD or TSR)	Cost Option	Cost Option
Conventional Memory	3K	42K	6K
File Locking	YES	YES	NO

FTP Software, 100 Rockstone Square, Andover, MA 01810 (508) 685 3300
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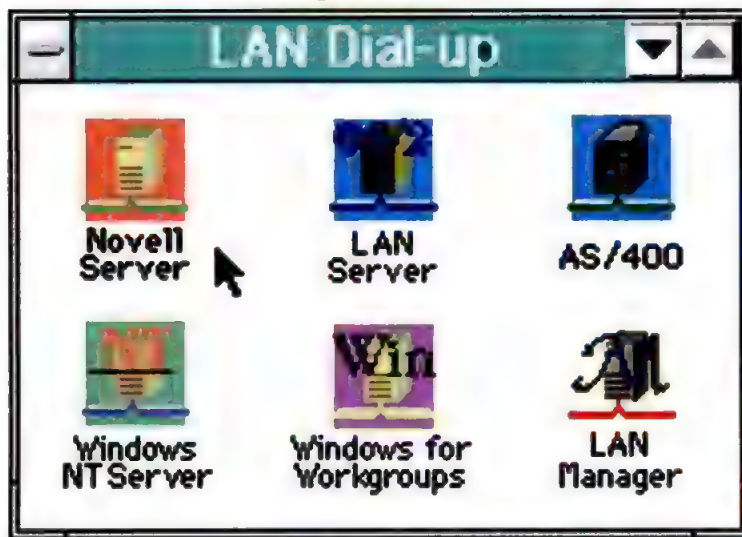
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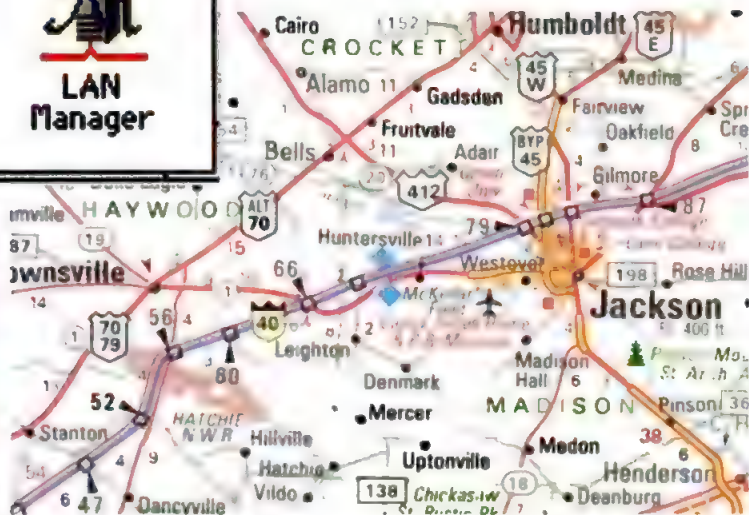


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CIRCLE 828 ON READER SERVICE CARD

ISDN MODEMS

IBM's WaveRunner Shows Promise

By Les Freed

More often than not, we see products from IBM that offer brilliant technology, but only in conjunction with mystifying drawbacks. The WaveRunner Digital Modem is no exception. This is a good product with a lot of potential, but it comes across as a bit rough around the edges. If you can live with the card's limitations, you'll find the WaveRunner a solid performer.

The WaveRunner is both an ISDN terminal adapter and analog-modem emulator on a full-size ISA or Micro Channel card. The card supports ISDN basic-rate connections at 64 Kbps, and also supports connections to Switched 56 services at 56 Kbps. As an analog modem, the WaveRunner can operate at speeds up to 14.4 Kbps.

The heart of the WaveRunner is IBM's MWave digital signal processor (DSP) chip. IBM uses the MWave's analog-to-digital conversion prowess to emulate standard analog modems. This gives the WaveRunner the ability to connect both to ISDN services and to conventional analog modems. This is the brilliant technology part of the story.

The mystifying drawback comes in three parts. First, because the WaveRunner emulates the AT command set when acting as an analog modem, the card requires one of the standard COM port addresses. The current version of the WaveRunner supports only COM1 and COM2, making the card difficult to install in machines that already have two serial ports in use. A newer revision of the board supports COM1 through COM4, but that card isn't currently available in the U.S.

Besides the COM port address, the WaveRunner also

requires an interrupt request line (in addition to the one required by the COM port), and a direct memory access (DMA) channel.

As we found when testing ISDN*tek's CyberSpace ISDN adapters, unused IRQ lines and DMA channels are often difficult to find in the new generation of networked multimedia PCs (see "Two ISDN Keys to Cyberspace," Network Edition, October 10, 1995). To make matters more complicated, the WaveRunner can use only IRQ 11 or IRQ 15, so your installation options are very limited. In order to install the WaveRunner in our loaded multimedia Pentium system, we had to temporarily disable the PC's auxiliary IDE interface to free up

support—or rather, the lack thereof. The rear panel of the WaveRunner board has the usual 8-pin ISDN U interface jack and a telephone handset jack. Although the handset jack is clearly marked "Handset," and even illustrated with a picture of a telephone handset, the WaveRunner documentation specifically says *not* to plug a handset into the jack. According to IBM, the jack is there "for future use." The MWave DSP chip on the WaveRunner certainly has more than enough horsepower to handle voice-to-digital conversion, so it seems very likely that future versions of the WaveRunner will offer voice support.

SOME BRIGHT SPOTS

Once you get past all of the hardware installation issues, the WaveRunner is easy to configure and use. The installation software guides you through the often-daunting task of con-

cludes a hardware diagnostic program, CommWare's TurboComm/2 communications drivers for Windows 3.x, and Trio DataFax Lite fax software. The TurboComm drivers are important if you're running Windows 3.x, since the standard Microsoft COMM.DRV communications driver can't handle ISDN speeds. One piece of software you won't find included with the WaveRunner is a TCP/IP stack—even though the card supports TCP/IP connections.

The WaveRunner modem emulator software supports a variety of modulation standards, including Bell 103 and 212A, V.22bis (2,400 bps), V.32 (9,600 bps), and V.32bis (14,400 bps). To use the WaveRunner as an analog modem, you simply start the emulator program and run your normal communications software. Your dial-up application will talk to the WaveRunner



BIG BOARD: The WaveRunner (pictured here next to the Intel PRO/100 adapter, left) is one of the biggest internal modems we've seen.

IRQ 15. Our only other option was to disable the network card to free up IRQ 11.

The second drawback is the WaveRunner's lack of an NT-1 ISDN line interface, something we've come to expect from ISDN products aimed at the small-office or home-office markets. As with the ISDN*tek cards, you'll have to shell out an additional \$150 to \$200 to connect the WaveRunner to your ISDN line. Apart from the cost, we dislike external NT-1s because they're large, require AC power, and contribute to cable clutter.

The final drawback regards the WaveRunner's voice call

figuring the ISDN line parameters, and allows you to test the configuration. This is important, as many ISDN lines won't work unless everything is configured just right.

One thing we really liked about the WaveRunner is the ISDN Port Monitor utility included with the card. This utility allows you to see the interaction between the WaveRunner and the telephone company switch. It may not sound like much, but we found this to be an important troubleshooting tool—one we wished we had when working with several other ISDN products.

Other bundled software in-

through the COM port just as if it were talking to an ordinary modem. An on-board speaker makes phone-dialing sounds—even though ISDN lines don't use dial tones or "touch tones" to connect. We tested the WaveRunner with CompuServe's WinCIM, Attachmate's Crosstalk for Windows, Datastorm's Procomm Plus for Windows, and Spy's Internet In A Box. All of these packages worked well with the modem emulator.

WaveRunner Digital Modem, Model 73G1393. List price: \$545. IBM Corp., Research Triangle Park, NC; 800-426-2255; Web, <http://www.ibm.com>.

Circle 957 on reader service card

NETWORK ADMINISTRATION

Comprehensive Virus Protection

By Tony Pompili

Next to backup, virus protection is possibly the most mundane of all network management tasks—but it's also one of the most vital. Fortunately, Intel offers a powerful antivirus package, LANDesk Virus Protect, Version 3.0, that can safeguard your NetWare servers and clients with an impressive array of scanning, checksum, and rules-based virus-detection routines.

Like Symantec's Norton AntiVirus for Networks (NAV), Virus Protect gives you a comprehensive weapon to battle viruses. Pricing is simple: \$995 per server, no matter how many users attach to the server.

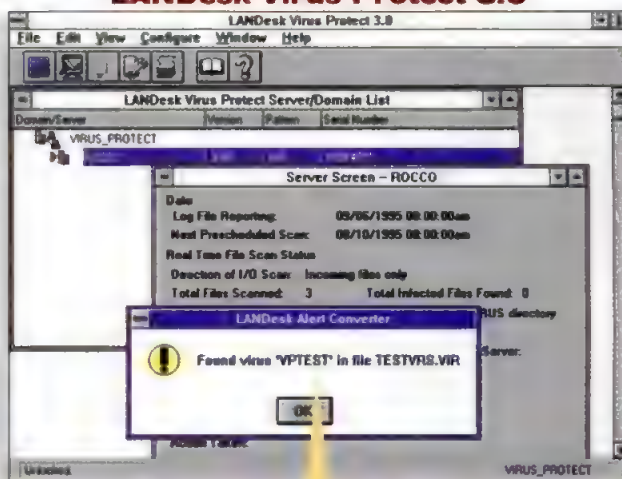
Virus Protect is not difficult to install on the server, and installation is downright easy in NetWare 4.1 environments. A

single .NCF file contains all of the necessary NLM information for running Virus Protect. Also, you can deactivate Virus Protect on a server by remarking out a single line in your AUTOEXEC.NCF file.

Once we had the software up and running, we discovered several impressive features. For example, a feature called Integrity Shield lets you prevent supervisors, administrators, or any other user with high-level rights from accidentally wreaking havoc on your network. This feature lets you limit a user to read-only rights to any file or directory on the network, regardless of the user's NetWare rights.

Virus Protect's basic virus-detection features are pretty solid as well. In addition to a pattern list that can help detect hundreds of viruses, the product im-

LANDesk Virus Protect 3.0



WARNING: When Virus Protect discovers a virus, it will notify the user, the administrator, or both that there's something wrong.

plements a checksum method of scanning that can pick out modified files, even if they were affected by previously unknown viruses. Once these files are identified, you can either replace them from your original media

or from backup copies.

Like NAV, Virus Protect also functions as a server watchdog by instantly scanning all files copied to the server. Additionally, Virus Protect scans every file on the server and updates each

THE NETWORKER By Diane Danielle

Upgrades: Be Cautious



With Novell pushing NetWare 4.1, and Microsoft pushing Windows 95, network managers have rarely been under so much pressure to "Upgrade Now!"

But in spite of all the hype from both vendors, the decision to upgrade is not a no-brainer. Before you hop on the bandwagon, ask yourself three questions: "Why do I want to upgrade? When should I upgrade? Who should do it?"

The *why* usually is one of four answers: (1) Your users want to because it's the "in thing" to do. (2) Your manager wants to because it's the "in thing" to do. (3) You want to because (a) it's the "in thing" to do or (b) it will solve nagging problems, make your life easier, and allow you to spend more time helping users. (4) An upgrade will make the business more profitable by letting you run applications you otherwise can't or by making you and your users more efficient.

I believe upgrades are worth the pain and risk only if they make your business more efficient or more profitable. But no network manager can afford to ignore the wishes of managers or users. You can fight a holding action against users only if you have management support. You can try to convince a gung-ho manager either that the upgrade isn't all it's cracked up

to be or that now is not the right time. If you marshal your facts, and your manager is reasonable, you have a good chance of succeeding. When the political situation is such that you can't deny either your manager or your users, you'll need to be even more careful than usual to involve them in all phases of the upgrade and to make sure they understand the risks.

If you're the only person who's gung-ho to upgrade, again ask yourself why. If you talk people into doing something they're not much interested in, you will be forgiven absolutely nothing that goes wrong, no matter who or what is at fault.

After, for whatever reason, you've decided the upgrade makes sense, the next question is when. NetWare 4.1 is a solid product, but I figure the next dot release will be even better. Win 95 will make me much happier when it's Win 96 or even Win 97. I don't

like spending the year after a rollout testing and implementing patches.

Lastly, you must decide who should be responsible for planning and implementing the upgrade. I admit to being of the "nobody can do it better than I can" school. Still, sometimes you need help.

Upgrades of the magnitude of Win 95 or NetWare 4.1 require lots of attention to detail. They require time the average network manager lacks. Even if you are a do-it-yourselfer, seriously consider hiring consultants or contractors to assist either in the planning or implementation. You'll need all the help you can get.

Diane Danielle, an independent networking consultant, can be reached on CompuServe at 72241,2566 or MCI Mail at 383-1159.



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CIRCLE 875 ON READER SERVICE CARD

NETWORK EDITION

First Looks

file's checksum information on a nightly basis or according to a user-defined schedule.

Because Virus Protect can work with Intel's LANdesk Management Suite 2.0, you can also receive notification of any virus-related events via NetWare broadcast, electronic mail, alphanumeric pager, or fax.

Of course, to protect your clients from viruses, you first have to install a Windows-based clients application (WinProtect) and a 14K TSR on each client PC. This is simple, thanks to an automated procedure that launches the installation and updates the local virus list right from each client's log-on script.

The TSR (VPRULE.EXE) looks for virus-like behavior on the boot sector or in memory. If any problems are detected, the TSR will immediately pop up a

warning to either the client, the administrator, or both.

You can determine who gets this notification, along with other parameters, through the Supervisor Configuration Utility. You can set parameters such as what time the server performs scans and which files to lock using Integrity Shield. You can also use this utility to monitor server activity in real time.

If you already use LANdesk Management Suite to monitor servers and clients, the Supervisor Configuration Utility can be launched directly from the LANdesk Control Panel.

LANdesk Virus Protect, Version 3.0. List price: \$995 per server. Intel Corp., Hillsboro, OR; 800-525-3019; 503-264-7000; Web, www.intel.com/commnet/sns/product/lv.html. Circle 960 on reader service card

NETWORK MAPPING TOOLS

Nodemap Comes to Windows

By O. Ryan Tabibian

The last time we looked at HavenTree's Nodemap 2.0, we developed a sort of love-hate relationship with the product. We loved the fact that it was one of the only packages on the market that could automatically discover and map your network. We hated the fact that it was available only for DOS and offered one of the worst interfaces we'd ever seen ("HavenTree's No-Frills Mapping Utility," Network Edition, July 1994). Now that Nodemap 2.0 is available for Windows, the relationship has more of a love-dislike feel to it.

Nodemap 2.0 for Windows (\$495) provides the same auto-

matic discovery feature we saw in the DOS version, but adds a better interface, more powerful query tools, and a large number of filters for exporting your diagrams to other graphics applications. What we don't like is Nodemap's speed: It can be painfully slow on moderately equipped PCs and on large networks.

Nodemap is very easy to install and configure. In fact, the whole package comes on only two floppy disks. Though a product's documentation is rarely fun, we found Nodemap's manuals to be noteworthy. Not only are they detailed and thorough, but they employ

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WINDOWS TCP/IP

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*LM 4300	4.3 GB	LT 3.5"
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**RS 9000	9.1 GB	RS 5.25"
LTX	Array Controller	LT 3.5"
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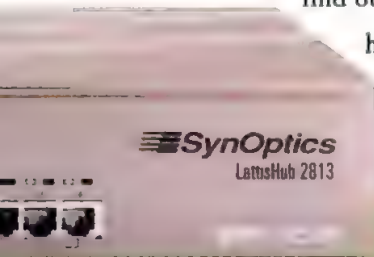
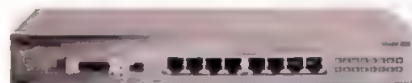
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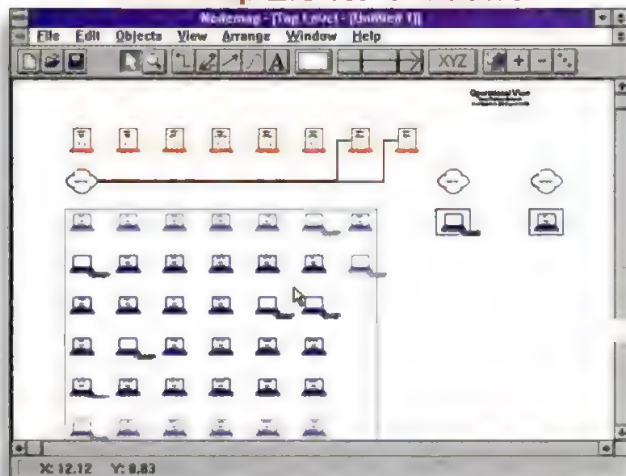
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First Looks

Nodemap 2.0 for Windows



just the right touch of humor to keep the reading light and (dare we say it) enjoyable.

Once the software is loaded, it takes all of two mouse clicks

to configure. The application begins discovering and mapping the network in a matter of minutes. The scanning process can take some time, however

(depending on the size of your network and the speed of your PC), and this is the biggest drawback to Nodemap 2.0 for Windows. On our test network, it took over 15 minutes to map only five servers. And even though the icons Nodemap utilizes to draw your network are basic line art, we found the screen redraws to be painfully

LOOKING BETTER:

Nodemap 2.0 for Windows provides a much-improved interface over previous versions.

slow on our 486 PC with 16MB of RAM.

Still, Nodemap provides some useful options for discovering and mapping your network. For example, the software can scan the network for either executive or operational

maps. For the executive map, Nodemap creates a very basic, high-level view of the network. The operational map is much more detailed and therefore can take much longer to generate.

Once the discovery process is complete, Nodemap creates a multilevel image that can be viewed, edited, or exported to other graphics applications. To get more detail on a device, you can click on its icon and see information such as print queues and volume names.

Nodemap has an extensive set of export filters, including support for .BMP, .GIF, TIFF, and even Unix Raster variants.

Nodemap 2.0 for Windows. List price: \$495. HavenTree Software Ltd., Kingston, Ontario; 800-267-0668; fax, 613-544-9632.

Circle 958 on reader service card

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Octopus captures file I/O directly from the NT Kernel without violating the integrity of the operating system or any resident application. The modular design of Octopus allows protection and compensation for loss of either source or target systems, loss of network support, loss of target file access and inadvertent file deletions.

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Octopus provides real-time mirroring at the file I/O level from any Windows NT source to any Windows NT target across your LAN and WAN. Octopus's proprietary electronic vaulting technique ensures data integrity in a manner transparent to the network and all of its users.

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Octopus takes less than one minute to install.

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Install and configure mirror specifications between any systems on the network from your own NT workstation with our intuitive GUI and drag-and-drop specification utility. Propagate file attributes and permissions to ensure data security.

Octopus Real Time Data Protection 1.42

DATA FAULT TOLERANCE

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- Easy to establish backup directories ✓
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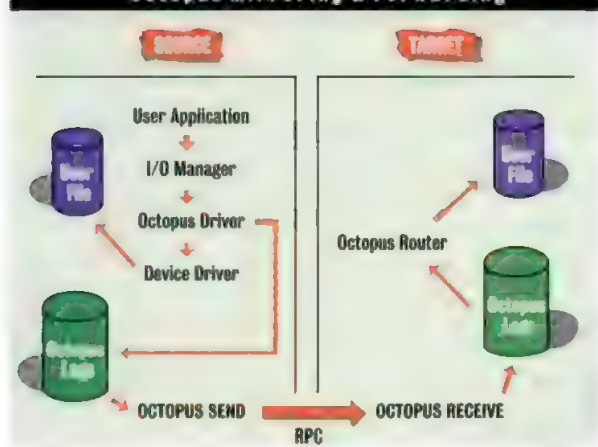
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New & Improved

NEWS OF ANNOUNCED PRODUCTS AND UPGRADES

By Eryn Brown

Farallon Helps Build Your ISDN Internet Link

In case you're hoping to use ISDN to connect your Ethernet network with the Internet, **Farallon Computing** is introducing a line of ISDN access routers that may ease your way. The Netopia 630, 640, and 650 all have plug-and-play support, work with MultiLink PPP and have internal NT-1 connectors. The Netopia 630 can support up to five users. The 640 and 650 models work with networks of unlimited size; the 650 is optimized for school environments and has special support for Apple products.

Netopia 630. Estimated street price: \$800. **Netopia 640.** Estimated street price: \$1,000. **Netopia 650.** Estimated street price: \$1,200. **Farallon Computing Inc., Alameda, CA; 510-814-5000; fax, 510-814-5023; e-mail, info@farallon.com.**

Circle 961 on reader service card



THE NETOPIA ISDN ROUTERS make it easy for you to make an ISDN/Internet connection.

Armon Presents Newest Member of OnSite Line

Armon Networking now sells OnSite NetReporter, a traffic-reporting add-on to its RMON-based management suite, OnSite Manager. Designed to facilitate collection and reporting for RMON data in SQL databases, NetReporter creates text- or chart-based reports. It can export data that is usable in network configuration applications.

OnSite NetReporter. List price: \$4,000. **Armon Networking Inc., Santa Barbara, CA; 805-965-0859; fax, 805-965-5689; Web, http://www.tmf.com/armon/armon.html.**

Circle 962 on reader service card



Software for Sharing CD-ROMs? See Stac

Now there's a new way for networked and remote Windows users to share CD-ROM resources—and it doesn't involve an auto-changer or jukebox. **Stac Electronics'** CD-QuickShare is a software package that provides multiple-user data access using only a single CD-ROM drive.

Here's how it works: CD-QuickShare reads CD-ROM data, compresses it, and writes it to a hard disk on a network server. Included applications help you organize and then access the stored information. Because you read from the server at hard disk speeds, CD-QuickShare improves efficiency.

CD-QuickShare is network-transparent and includes metering features to report on license use. Stac is also circulating the CD-QuickShare CD-ROM License Metering Toolkit. Free to CD-ROM developers, this package lets them author titles that will be automatically recognized and tracked by the CD-QuickShare metering tools.

CD-QuickShare. List price: \$500 (5 concurrent users—5 CD-ROM disk version). **Stac Electronics, San Diego, CA; 800-522-7822, 619-794-4300; e-mail, info@stac.com; Web, http://www.stac.com.**

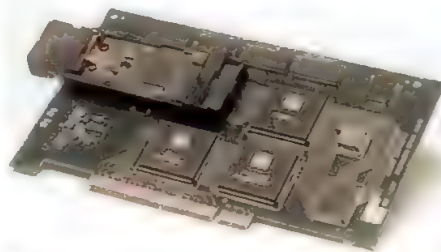
Circle 975 on reader service card

LightPulse Fibre Channel Adapter From Emulex

The Fibre Channel interface standard is among the up-and-comers of the high-speed connectivity world. Able to run over a variety of topologies, it will allow data transfer at up to 1 Gbps, full-duplex mode. **Emulex's** new LightPulse Fibre Channel PCI Adapter, set to ship in the beginning of 1996, is an I/O interface card that operates as an ANSI Fibre Channel as well as a PCI Local Bus device, and it will be optimized initially for Unix and Windows NT. It works with copper or fiber-optic cabling and can complete transfers at quarter, half, or full speed.

LightPulse Fibre Channel PCI Adapter. List price: \$1,995. **Emulex Corp., Costa Mesa, CA; 714-513-8109; Web, http://www.emulex.com.**

Circle 963 on reader service card



EMULEX'S FIRST FIBRE CHANNEL PRODUCT is the LightPulse PCI Adapter, due in 1996.

Hadax Offers Affordable Digital Link Backup

Backing up digital links can be an expensive undertaking, but **Hadax Electronics'** new ISDN Fall-Back Switch (FBS) may make the hit less painful. The FBS uses a Basic Rate ISDN line to back up a variety of transmissions. Able to operate at speeds up to 128 Kbps, the FBS ships ready to use, with a terminal adapter and NT-1 circuits. The device can be controlled using Hadax's new MiniNet ISDN management software.

ISDN FallBack Switch. List price: Single-port version, \$1,095. **MiniNet.** List price: \$1,495. **Hadax Electronics Inc., South Hackensack, NJ; 201-807-1155; fax, 201-807-1782.**

Circle 964 on reader service card

NETWORK EDITION

New & Improved

Mascot + Terminal = Unix Multitasking

No one expects Unix interfaces to mimic Windows' pretty pictures, but an occasional foray into multitasking features never goes unappreciated. That's why **JSB Corp.** has released the latest update to MultiView Mascot, a product that provides multiple-session and Motif-style windowing for character terminals. Version 4, which is available on AIX and SCO, features Mascot Watcher, an enhancement that lets you monitor mail, file, and windowing operations. When triggered (for instance, by an incoming mail message), Mascot Watcher produces pop-up messages and dialog boxes.

MultiView Mascot 4. List price: 8-user license, \$495. **JSB Corp.,** Scotts Valley, CA; 408-438-8300; fax, 408-438-8360; e-mail, info@jsb.com. Circle 965 on reader service card



THE NEW UPDATE TO MULTIVIEW MASCOT lets Unix users multitask at their character terminals.

Peer-to-Peer(s) from Close-Up/LAN Pro

You've always been able to connect one PC to a server and one PC to another PC. Now **Norton-Lambert Corp.** gives you a new way to connect one PC to a group of others with Close-Up/LAN Pro. Useful in workgroup and classroom environments, Close-Up/LAN Pro lets users on a network share Windows and DOS applications in real time by connecting to a "Host" PC, which can be any of the machines in the group. The software includes a special modem version for remote access. It also features Expert System self-installation and virus checking.

Close-Up/LAN Pro. List price: 2-user version, \$399. **Norton-Lambert Corp.,** Santa Barbara, CA; 805-964-6767; fax, 805-683-5679; e-mail, 72662@compuserve.com.

Circle 966 on reader service card

BRIEFS

HARDWARE

Asanté Technologies will provide updates for Windows NT and Windows 95 for its 10/100 Fast Ethernet adapter card, which was introduced in July. The company also reduced the price for its FriendlyNet adapter (\$49). 408-435-8388.

Ascend Communications has upgraded its remote-access product line. Products in the Pipeline and MAX families can now route IPX. Ascend is also offering optional support for V.110 and V.120 rate adaption. V.120 comes as a software upgrade (\$1,000), while the V.110 option is available as a slot card for the MAX only (\$6,000). 510-769-6001.

Intellicom is now shipping a new 100-Mbps I/O module (\$750) and the HSM III (\$2,750), a High-speed Switching Module. These products add new high-speed port-switching capabilities to the company's OfficeStak stackable hubs. 818-407-3900.

Leunig Communications has introduced Net44 for Windows 95 (\$249.90). The product networks up to four PCs through their parallel ports, using printer cables. No additional network hardware is required for installation, which also enables print sharing. 800-441-6562.

Multi-Tech Systems is now shipping its V.34 MultiModem-PCS Digital Simultaneous Voice and Data (DSVD) modems. Available in internal (\$499) and desktop (\$899) configurations, these modems take advantage of Talk Anytime, a Multi-Tech technology, which lets you send or receive data and talk simultaneously with the other end of a modem link.

U.S. Robotics is now offering the DataView connector for its Sportster 28.8 PCMCIA modem (\$399 together). The DataView connector has four LEDs that let you monitor your modem's power, send, receive and online functions—just as you

Garrett's Newest Will Aid Workgroups

Adding a bridge to your network can increase available bandwidth by isolating network segments, improving general performance. **Garrett Communications** has announced the Magnum 30x Workgroup Bridge, which works with Ethernet networks. The bridge is able to learn up to 256 local workgroup addresses almost immediately. And newly available is the Magnum 20x Two-Port Repeater, also an Ethernet device.

Magnum 30x Workgroup Bridge. List price: \$995. **Magnum 20x Two-Port Repeater.** List price: \$495. **Garrett Communications Inc.,** Fremont, CA; 510-438-9071; fax, 510-438-9072; Web, <http://www.garrett.com>; e-mail, marketing@garrett.com.

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MORE AVAILABLE BANDWIDTH: Place the Magnum 30x Workgroup bridge on your network.

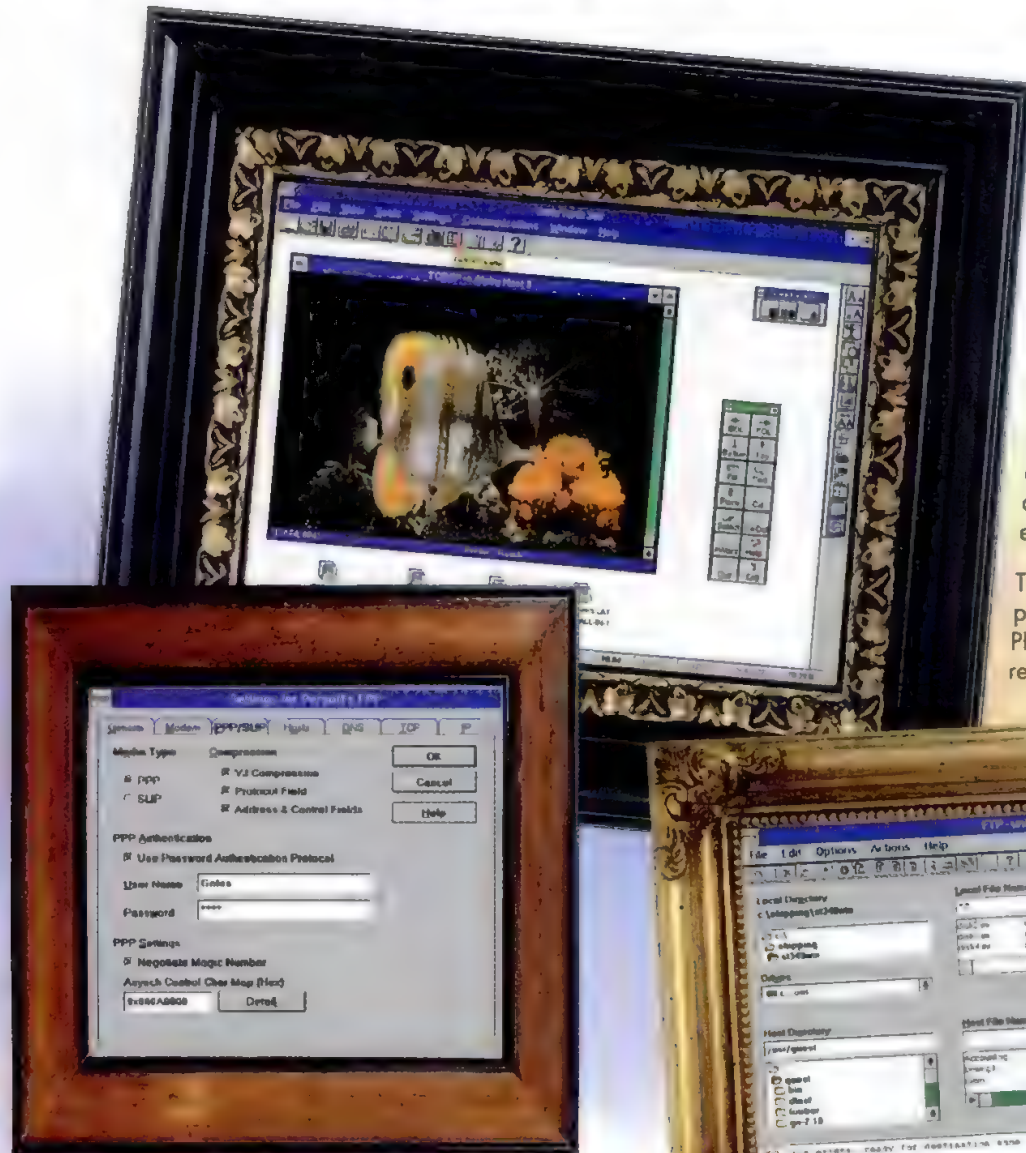
How Windows 95 Came to the Macintosh

If you work in an environment that links PCs to Macintoshes, you may already be familiar with Miramar Systems' Personal MacLAN Connect. With Version 5.5, the company has enabled its Windows-to-Mac cross-platform software to work with Windows 95. The package allows bidirectional file and print sharing. Miramar is planning another upgrade to Personal MacLAN Connect, due to ship in early 1996, which will feature full integration with Microsoft's new operating system.

Personal MacLAN Connect 5.5 for Windows 95. List price: \$199. **Miramar Systems Inc.,** Santa Barbara, CA; 800-862-2526, 805-966-2432; e-mail, miramar@pacrain.com.

Circle 968 on reader service card

The Art of Smart



SmarTerm for Windows offers a true MDI interface and automation tools to reduce support costs.

SmarTerm's TCP/IP stack offers drag-and-drop FTP and an FTP file viewer for easy file transfers.

TCP Addition™ for SmarTerm provides a sophisticated PPP/SLIP dialer for efficient remote access.

SmarTerm® is a fine art form. High-end host connectivity and TCP/IP make SmarTerm the corporate standard of choice for DOS, Windows, Windows NT, and Windows 95. Whether you need VT, TN3270, Data General, SCO Console, ANSI BBS, TCP/IP, LAT, PPP, or SLIP-SmarTerm is your very own masterpiece.

Persoft has painted an entire series of SmarTerm emulations, added a completely Windows-based TCP/IP stack (a Windows Sockets DLL), and given you the power to create your own work of art with its automation tools. If you want the Art of Smart, then you want the Art of SmarTerm.

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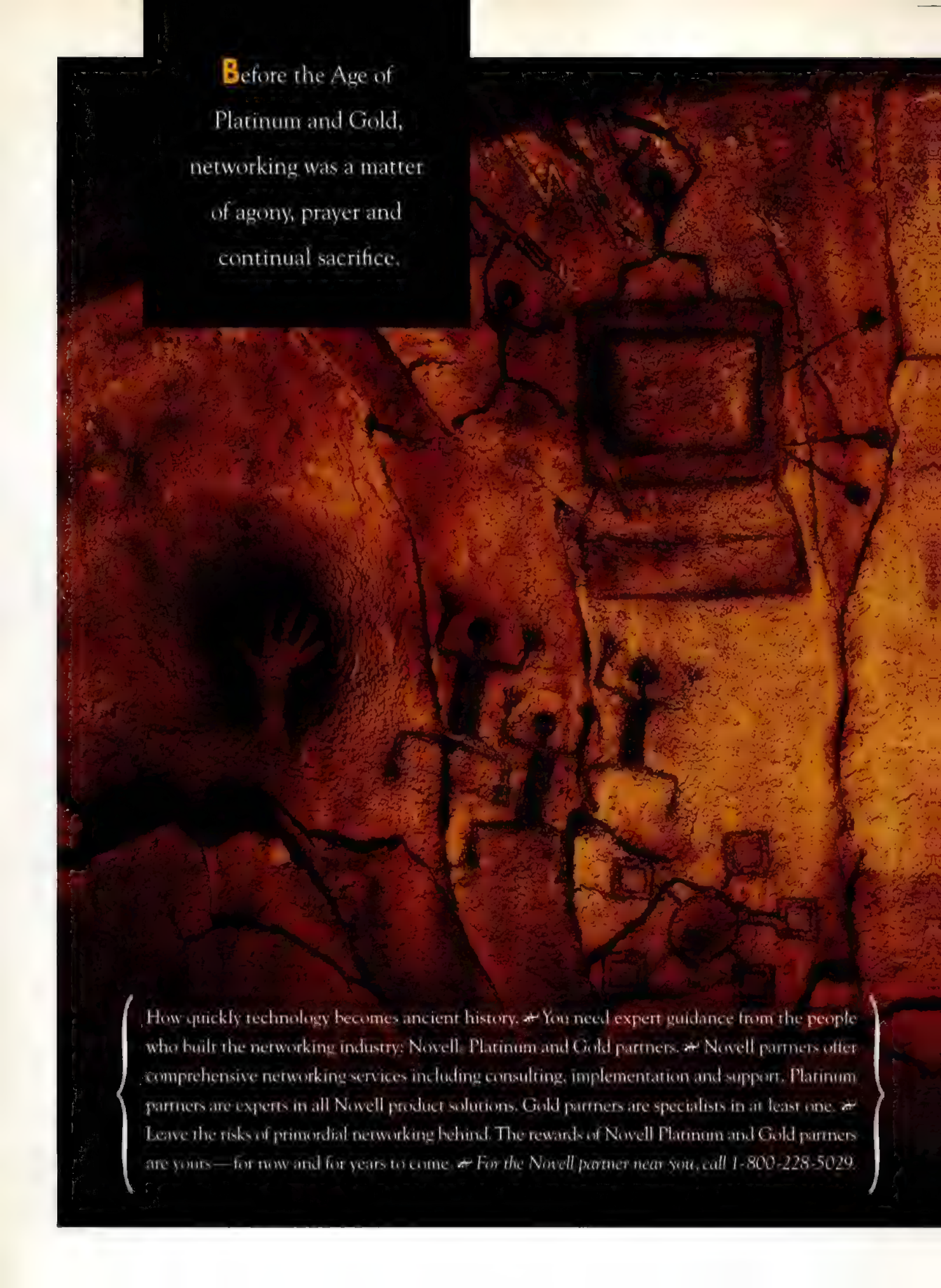
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networking was a matter
of agony, prayer and
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 NOVELL

New & Improved

Eicon Links to Assorted LANs, WANs, ISDN

Here's some news for the user who needs to be free—when it comes to connectivity, that is. **Eicon Technology** is introducing the Eicon S51, the first network adapter card in the Multiservice Access Card family. Equipped with serial and dial-up ports, the S51 card works with protocols such as IP, IPX, and AppleTalk; it enables ISDN, frame relay, X.25, and SNA connections as well. Eicon also now offers two new PacketBlaster adapters for the ISDN PRI and quad-BRI interfaces.

Eicon S51. List price: \$1,495. **PacketBlaster/ISDN PRL.** List price: \$9,995. **PacketBlaster/ISDN BRI.** List price: Starts at \$3,995. **Eicon Technology Inc.,** Dallas, TX; 214-239-3270; fax, 214-239-3304; Web, <http://www.eicon.com>.

Circle 976 on reader service card



THE EICON S51 ADAPTER connects your PC to ISDN, frame relay, X.25, and SNA links.

WanderLink: Enhanced Remote Node from Funk

With more and more people taking laptops on the road or booting up at home, remote-computing solutions need to be flexible. With WanderLink v2, **Funk Software** has added new features and performance enhancements to keep you productive. Formerly only able to link remote nodes with NetWare networks, WanderLink now offers IP support as well. At setup, WanderLink installs Novell's Virtual Loadable Module (VLM) 1.2 client, which lets you connect with your network from Windows and speeds node performance. In case you want to work through remote control, the new package also includes Proxy 1.5, which has been optimized for speed: It now uses a smaller host TSR (down to 9K from 36K).

WanderLink v2. List price: With 1 port, \$295; with 2 ports, \$495; with 16 ports, \$2595. **Funk Software Inc.,** Cambridge, MA; 617-497-6339; e-mail, sales@funk.com; Web, <http://www.funk.com>.

Circle 977 on reader service card

BRIEFS

would on a desktop model. 708-982-5010.

Xircom has announced price reductions for its Netwave wireless LAN products. The Credit-Card Netwave Adapter, formerly \$599, now lists for \$399—and first-time installers can buy it together with the Netwave Access Point for \$799. The company has also upgraded its software. Netwave Release 2.5 provides new utilities and seamless roaming and is available free of charge to users. 800-438-4526.

Xyplex has announced several new products in its SX-6600 standalone workgroup switch product line. There are two new 10-Mbps switches, the SX-6602 (8-port Ethernet, \$6,995) and the SX-6611 (12-port fiber, \$12,995). The company is also offering high-speed interface modules for 100Base-TX (\$2,995), 100Base-FX (\$3,495), and 100VG (\$4,495) and a new 4-port Ethernet module (\$2,450). 508-952-4700.

SOFTWARE

Galacticomm has reduced prices for its BBS packages. Upgrades to Worldgroup, the company's new software, now cost \$199. User six-packs for BBS system expansion are selling for \$295, and subscriptions to Galacticomm's Automatic Software Update Program are \$395 per year. 800-328-1128, 305-583-5990.

J1 Systems is now shipping NetXRay (\$995), a Windows 95-compatible GUI protocol analyzer and network monitor. The analyzer will work with LAN topologies including Ethernet, Token-Ring, and Fast Ethernet. It has intelligent capture and display filters as well as traffic generation tools. 404-671-9272.

Lanworks has introduced BootWare, a set of products that makes it possible for networked PCs to boot from a server rather than a local drive. Expected uses for the product include installing Windows 95 over networks—for testing and operation purposes. 905-238-5528.

ComManager Pro CTI Bundle Now Shipping

The proliferation of computer telephone integration (CTI) solutions continues. **Siemens Rolm Communications** has announced availability of ComManager Pro, a Windows CTI solution for the desktop. Included in the bundle are the ComManager desktop software, a TAPI driver, the Easy-Add snap-in DCO modules for ROLMphone telephones, an RS-232 cable for linking the telephone to the PC, and a power supply. You have to buy the telephone and a Siemens Rolm 9751 model 30 or 80 PBX separately. ComManager has a point-and-click interface for controlling your messaging and telephone systems and supports DDE and TAPI.

ComManager Pro. List price: \$299. **Siemens Rolm Communications Inc.,** Santa Clara, CA; 800-765-6123, 408-492-2000; Web, <http://www.siemensrolm.com>.

Circle 978 on reader service card



EVERYTHING YOU NEED—EXCEPT THE PHONE: ComManager Pro bundles CTI software, accessories.

CR2-RAID: Greater RAID Storage Capacity

Those of you who depend on **Conner Storage Systems'** CR2-RAID subsystem will be pleased by the company's latest enhancements to the product: The CR2-RAID will now work with 4.2GB hard disks and with Fast/Wide SCSI-2. These new capabilities increase the system's storage capacity as well as its speed: It can now transfer data as fast as 20 MBps, with an average drive seek time of 9 milliseconds. The CR2-RAID provides uninterrupted access to files when a drive or power supply fails (in a mirrored or duplexed configuration). It has a modular design and includes dual cooling fans.

CR2-RAID. List price: Starts at \$3,095. **Conner Storage Systems Group,** Lake Mary, FL; 407-263-3500; fax, 407-263-3555.

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New & Improved

DiscPort Plus: Enhanced CD-ROM Access

Managing access to multiple CD-ROM drives can get sticky. But DiscPort Plus, Microtest's latest addition to its DiscPort CD-ROM networking product line, should make things a little easier for NetWare users. Each DiscPort Plus unit can provide user access to seven drives. About the size of a videotape, the units can reside anywhere on the network and do not require network downtime for installation. The included DiscView PRO software lets you set up CD-ROMs as NetWare volumes or subdirectories. DiscView PRO also includes SmartLaunch, which provides one-step access to CD-ROM applications.

DiscPort Plus. List price: Ethernet version, \$895; Token-Ring version, \$1,295. Microtest Inc., Phoenix, AZ; 800-526-9675, 602-952-6400.

Circle 969 on reader service card



AIRSOFT'S POWERBURST is a straightforward path to speeding your remote-node performance.

Powerburst Speeds Up Remote-Node Access

One of the greatest frustrations remote-node users have is slow performance. AirSoft's new Powerburst remote-node accelerator software tackles this problem, which results from ISDN-and modem-links' relatively small bandwidths. Made up of a client component and a LAN-based Agent (which runs on a dedicated PC), Powerburst accelerates apps by using advanced caching and redundancy-reducing algorithms. It is compatible with a variety of network media, protocols, remote-access servers, and security tools.

Powerburst. List price: Client, starts at \$60; Agent, \$498. AirSoft Inc., Cupertino, CA; 408-777-7500; e-mail, sales@airsoft.com.

Circle 970 on reader service card

BRIEFS

LaserData now offers a Windows NT version of Optical Storage for Networks (OS/N, starts at \$1,795). This optical storage management product, previously available for NetWare only, lets you write to devices including WORM, CD-R, and CD-ROM and has features including caching, prefetching, and file staging. 508-649-4600.

Palindrome is now selling the Palindrome Visual Storage Administrator (VISTA, \$1,995), an application that manages the company's Backup Director 4.0 and Storage Manager 4.0 backup and storage systems. The software manages multiple installations and provides alert monitoring and global reports. 708-505-3300.

PictureTel has introduced LiveTalk (\$99 or included at no cost with LiveShare Plus data conferencing software). LiveTalk works as an enhancement to LiveShare Plus and provides simultaneous voice and data transmissions over a single analog telephone line. The product requires no additional hardware. 508-762-5000.

Radcom has added new protocol support to its WAN and LAN analyzers. Available as a software package (\$2,500 or free of charge to current users of RC-100WL-EA, Version 1.85), the upgrade includes over 140 protocols and all the popular interfaces.

ANNOUNCEMENTS

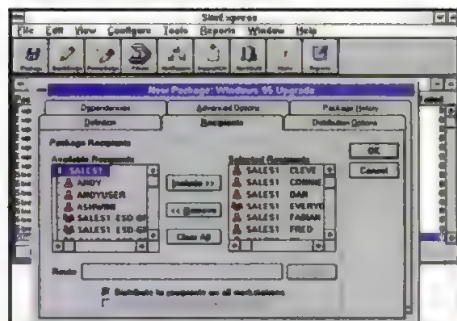
Acsys has expanded the offerings in its NetGain outsourcing services for remote offices to include electronic software distribution and virus management. NetGain ESD will cost \$450 per LAN per month for current NetGain clients and \$600 per LAN for other customers and allows you to make an unlimited number of software upgrades to all desktops on your LAN. NetGain Virus Management Software is free for NetGain clients. 617-270-5566.

SiteExpress 3.0 Helps You Migrate to Win 95

Because of the widespread clamor for Windows 95, network administrators everywhere are thinking about software distribution solutions—and McAfee is catching the wave. SiteExpress 3.0, a new product that builds on the distribution capabilities in the BrightWorks suite, works with NetWare 3.x and 4.x servers to install software on Windows 95, Windows NT, DOS, and OS/2 clients. In addition to optimization for Windows 95, SiteExpress 3.0 supports TCP/IP for distribution to remote servers and has new installation aids, including wizards. The next update to the software will be free to Version 3.0 users and will offer added inventory reporting integration.

SiteExpress 3.0. List price: Starts at \$10.50 per node (two-year subscription). McAfee, Santa Clara, CA; 408-988-3832; fax, 408-970-9727; Web, <http://www.mcafee.com>.

Circle 971 on reader service card



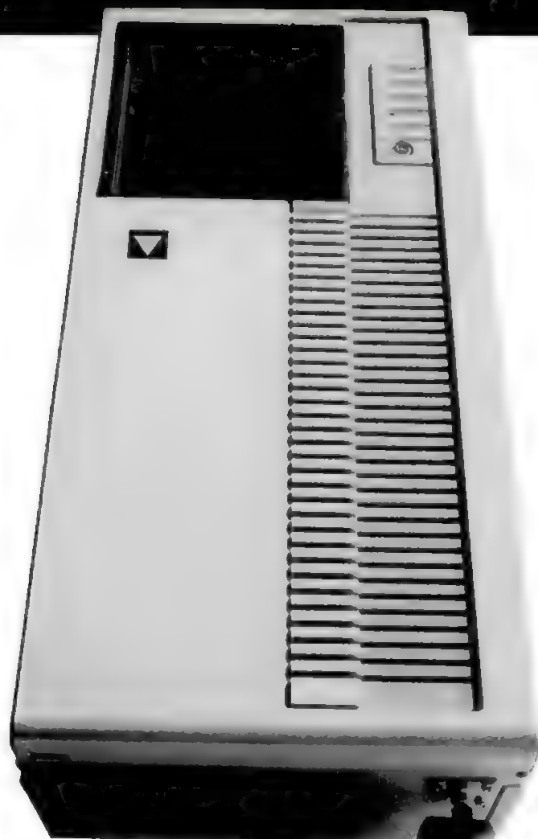
WINDOWS 95 MIGRATION can be a lot easier if you use the latest version of SiteExpress.

Capture More with Probe Hard Disk Option

Network testing devices have the potential to capture a great deal of data. That's why Network Communications is now shipping the Network Probe 7000 series Hard Disk Option. An optional device you can use with the Network Probe 7000 series testing equipment, the Hard Disk Option is a battery-operated storage device for captured data. You can also use it to store other add-on instruments in the 7000 series. The unit weighs less than 10 pounds.

Network Probe 7000 series Hard Disk Option. List price: Starts at \$9,490 with Network Probe unit. Network Communications Corp., Bloomington, MN; 800-213-8893, 612-844-0584; fax, 612-844-0487; Web, <http://probe.netcommcorp.com>; e-mail, postmaster@netcommcorp.com.

Circle 972 on reader service card



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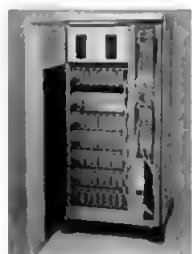
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ICONect Featured in New TinyTerm Releases

Here's another updated suite of products for business desktop connectivity: **Century Software's** TinyTerm Series. The new release offers new versions of TinyTerm, TinyTerm Plus, and TinyTerm+NFS as well as a brand-new professional-level product, TinyTerm Pro. All of the TinyTerm products are designed to provide connectivity options not present in Windows 95, including NFS support. They also incorporate ICONect, a new technology that lets you set up desktop icons for making network connections.

TinyTerm Series, Version 3.0. List price: Starts at \$79 per user. Century Software Inc., Salt Lake City, UT; 800-877-3088, 801-268-3088; fax, 801-268-2772; Web, <http://www.censoft.com>; e-mail, sales@censoft.com.

Circle 973 on reader service card

BRIEFS

Proxim and Kalidor have announced that they will be working together to incorporate Proxim's RangelAN2 technology into Kalidor's K2000 family of pen-based computers. The new product, which will be designed for outdoor uses such as field inspection, will integrate the wireless capability fully within the unit. 800-252-5436, 909-931-3888.

Radish Communications Systems and NEC Technologies have announced that Radish's VoiceView integrated voice and data protocol and VoiceView TalkShop software will ship with NEC Ready multimedia computers, providing advanced telephony capabilities for users.

New Enhancements to SQL<>Secure

If you need a security suite for a client/server RDBMS environment, check out SQL<>Secure, Version 4, the latest release from **BrainTree Technology**. SQL<>Secure provides password and auditing management tools for Unix and OpenVMS servers. New features include tools that let you delegate password administration to departmental managers and two new auditing functions, user-defined auditing and user-defined alerting. SQL<>Secure also features break-in scanning, detection, response, and evasion, analyzing the data collected to help build up your database defenses.

SQL<>Secure, Version 4. List price: Starts at \$7,500. BrainTree Technology Inc., Norwell, MA; 800-232-5215, 617-982-0200; fax, 617-982-8076; e-mail, info@brntree.bti.com.

Circle 974 on reader service card

MULTIPLE ACCESS By Frank Derfler

My Three Mistakes



People feed me information with fire hoses. I talk to users, developers, managers, and investors. I get lots of opinions and facts, mix them with experience, and draw my own conclusions. Sometimes I'm wrong. But hey, if you're doing lots of stuff you're going to make an occasional bad call. So,

to set the record straight, here are three investments I told some of you never to make. I was wrong.

Data/voice modems: I pooh-poohed these products because of the conflicting standards and the rush to ISDN. But I recently became a believer when I saw the numbers on how much money companies can save by using data/voice modems for tech support. These multilingual boxes make sense in several other important vertical applications. Digital Simultaneous Voice and Data (DSVD) is an elegant standard and the international committees love it. VoiceView, developed by Radish Communications, is less elegant, has lower voice quality, won't economically work over digital PBX lines, and costs a lot less. After the bowl games on the next New Year's Day, pick up *PC Magazine* and look for lower priced DSVD modems. I think DSVD technology will win and that there will be some very practical applications.

ISDN/analog modems: I thought that all ISDN adapters

should act like LAN adapters. I didn't see the advantage of making them act like modems until I saw hybrid ISDN/analog products. ISDN/analog modems are really neat. You install an ISDN line and hook it to the ISDN/analog device. If people call in from analog lines, the telephone company switch tells the ISDN/analog modem what kind of call is coming in and it answers with V.34 or other analog modem tones. If people call using ISDN or Switched 56, it answers and cruises along at 56, 64, 112, or 128 Kbps. U.S. Robotics has a great entry into the market with the Courier I-Modem. It blends ISDN with USR's V.Everything technology. 3Com is only slightly behind and Motorola and others will enter the field. But prices reach around \$800 at

the high end, so these products are strategic investments. But the flexibility and throughput they provide make them easy to justify.

Direct broadcast satellite: I said, "Who needs more channels?" Several companies offer DBS receivers with 18-inch dishes. I scoffed. But what's the RS-232 port doing on the back of the high-end dual-receiver models? Could it be that you could download software, Web pages, infobases, and other stuff using your telephone line as a slower back channel? Could it be that all of those arguments about fiber to the curb or cable modems are already overcome by events?

You betcha it could! Why should big money invest in a relatively inflexible wired infrastructure when it can broadcast direct? If you buy yourself a DBS receiver so you can watch all the action leading up to the bowl games, then be sure to get one with the RS-232 port on the back. Data delivery isn't here quite yet, but it's a great rationalization!





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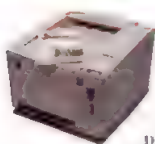
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Most people call the powerful, new NetWare® 4.1 NetWare Directory Services™ (NDS™) the perfect way to manage a network. Dave West, LAN/WAN administrator at Long

network. It's the network standard that allows users to log in once and gain access to any file, document or resource for which they're authorized, no matter where it is. Even more importantly, Dave West can



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John Silver's restaurants, calls it a "dream come true."

You see, the previous generation of network operating systems only let you view the network one server at a time. But with NetWare 4.1 you get a complete view of the

manage his entire NetWare 4.1 network from his own desktop.

There are also many Novell and third-party products that help you maximize the power of NDS; everything from applications like Novell GroupWise™ that helps workgroups

communicate better, to fault-tolerant solutions like NetWare SFT III™ server mirroring and third-party utilities that help you better manage your NetWare 4.1 network environment.

Bottom line? The simplicity of NetWare 4.1 makes Dave West and his administrators a lot

the popcorn shrimp,
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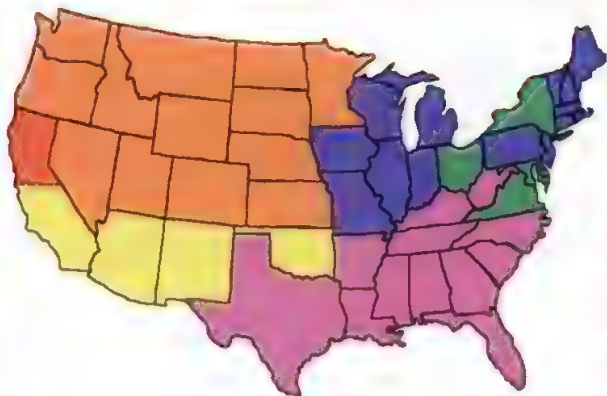
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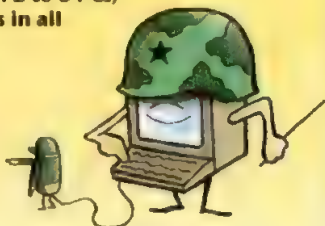
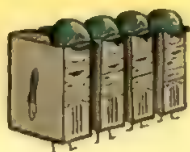
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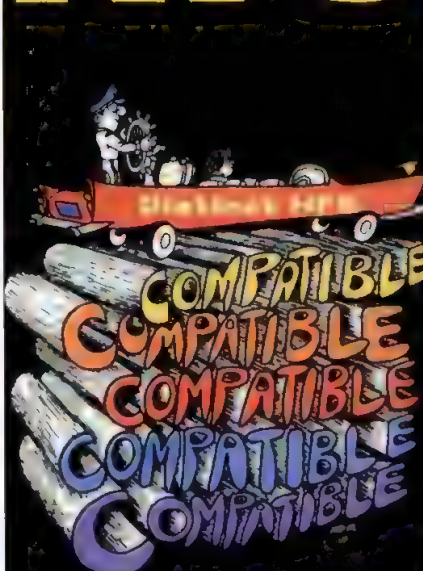


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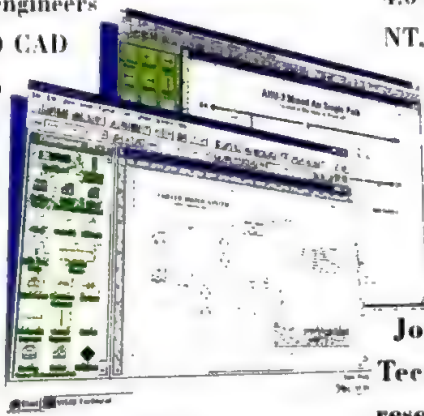
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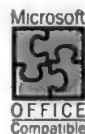
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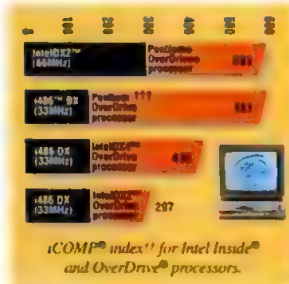
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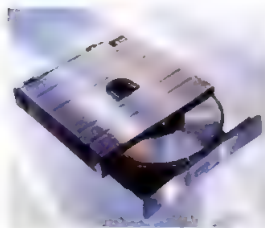
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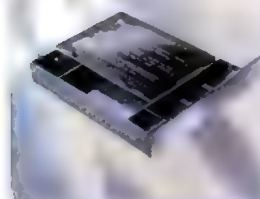


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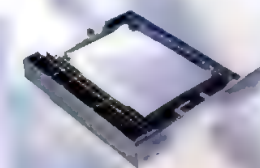
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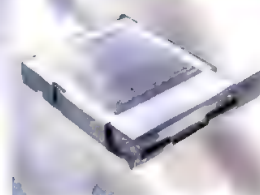
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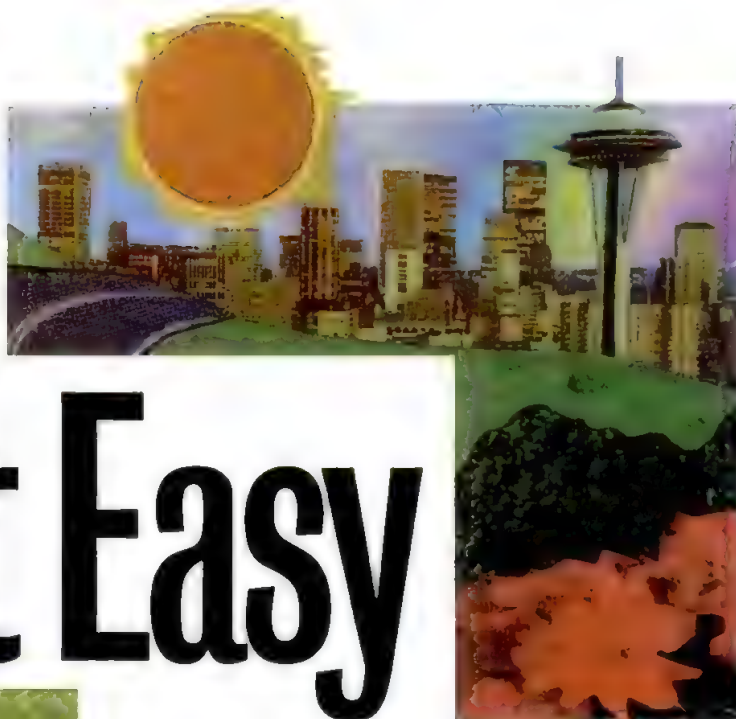
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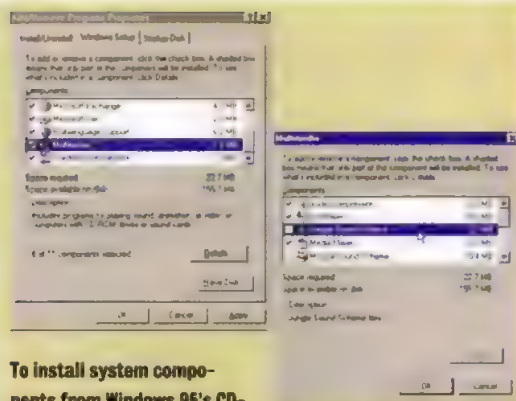
With Windows 95, the road to success has some hidden curves and potholes. Here's a guide past the glitches and stumbling blocks to get you to some of its most powerful features.

By Larry Seltzer

By and large, Windows 95 is pretty slick. It makes a lot of things easy that were awkward in Windows 3.1 and makes other things possible that you once couldn't do at all. At the same time, Windows 95 still has some pretty rough edges. This is especially true of features that go beyond the basics, those that can give you extra power and control if you know how to use them.

This story shows you how to get more out of Windows 95 by mastering its difficult side. We'll show you how to get the right features and drives installed, and how to control and troubleshoot the boot process. We'll look at multiple user profiles and security issues, and overcome some of the bafflements of the Windows 95 shell. We'll cover powerful features for mobile users and discuss how to avoid potential networking traps.

Finally, we'll look at some well-hidden tools for running DOS software and connecting to third-party Internet providers. Windows 95 isn't always as easy as it looks, but the power is there, ready to be tapped.



To install system components from Windows 95's CD-ROM, bring up the Add/Forward/Remove Program Properties applet from Control Panel and move to the Windows Setup tab.

UP AND RUNNING

► Add those missing components.

You just installed Windows 95, so you've got access to all its components, right? Not necessarily true. Especially if you choose the default Typical setup, you'll soon find yourself searching for features like Quick View and System Monitor that you've read about but just can't seem to find. As long as you have access to the Windows 95 distribution CD-ROM, you can add them easily. To do so, you must select them explicitly from a deeply buried menu.

To add features that weren't included in a basic installation, click on the Start button and select Settings/Control Panel. Then, launch Control Panel's Add/Remove Programs applet. If you insert the Windows 95 CD-ROM in your drive, Windows 95 automatically brings up a window with an icon for launching the same applet.

To add a particular feature of Windows 95, choose the Windows Setup tab in Add/Remove Programs. You will see a list looking much like one you saw when you installed Windows 95. To install Quick View—a set of file viewers which comes with Windows 95, but which the Typical setup does not install—double-click on the Accessories line. Another list of individual accessories will appear, with Quick View among them. Check the box to its left,

click OK, and Windows 95 will install Quick View.

Windows 95 provides a number of other handy programs, which it does not include in a Typical installation. One example is System Monitor, which lets you view in real time the load you are imposing on the different subsystems in your computer. Another is Resource Meter, which installs as an icon on your System Tray, and takes you to a utility showing the current level of system resources available.

The Add/Remove Programs applet is also the facility which well-behaved Windows 95 applications use to let you add or remove their own features. The Install/Uninstall tab in the applet displays a list of applications which support this facility. Double-click on one of the applications on the list and Windows 95 launches that application's own Add/Remove facility.

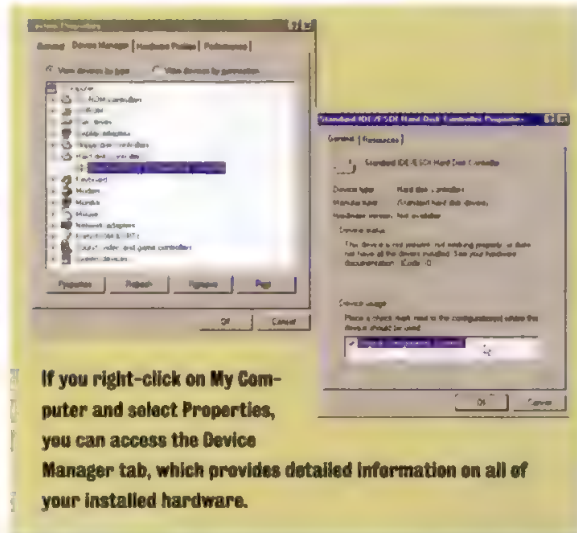
Note that not all setup options are available on the floppy disk versions of Windows 95. In order to be able to install CD Player, System Monitor, Quick View, Mouse Pointers, the Resource Kit, and a number of other tools, you'll need the CD-ROM version.

► Get rid of real-mode drivers.

It's great that Windows 95 supports real-mode DOS device drivers, but there are lots of good reasons why you'll prefer 32-bit protected-mode device drivers. They can be dynamically loaded and unloaded, they don't consume conventional memory, they can boost performance by cutting down on the number of mode switches your system performs, and they make systems easier to configure by supporting Plug and Play. This makes it all the more annoying that Windows 95 doesn't always

install protected-mode drivers during a system upgrade. Sometimes it does install the protected-mode drivers, but it doesn't remove the real-mode drivers.

To find out what your driver status is, print out your AUTOEXEC.BAT and CONFIG.SYS files after performing the Windows 95 upgrade. With this information in hand, right-click on My Computer, choose Properties, and select the Device Manager tab. What you see is an outline of all the types of devices in the system and the specific devices of that type recognized by Windows 95. For the most part, the devices which Windows 95 recognize are being serviced by protected-mode drivers. Switch over to the Performance tab in the System Properties dialog; if you are running any real-mode drivers, Windows 95 will probably tell you here.



If you right-click on My Computer and select Properties, you can access the Device Manager tab, which provides detailed information on all of your installed hardware.

With some devices—PC Card (PCMCIA) slots and cards in particular—Microsoft argues that there is no sufficiently safe way for Windows 95 to remove your DOS and Windows drivers and install protected-mode drivers during the upgrade. Apparently, the system is likely to become unstable if Windows 95 makes the wrong decision during installation. Microsoft's solution is to run the Add New Hardware Wizard to install PCMCIA support. This Wizard walks you through the process of commenting out the DOS and Windows drivers for your system and then recognizing the devices for protected-mode support.

Even if Windows 95 successfully recognizes a device and loads protected-mode drivers for it, it may still be loading

Our Contributors: LARRY SELTZER is a technical director at PC Magazine Labs. THOMAS MACE was the senior editor in charge of this story, and JAY MUNRO was the project leader.

You will notice that some things behave differently; for instance, your windows will have the new Windows 95 style.

Before you decide to move back in time, be forewarned: Program Manager still uses the old Group files, not the new Programs folders. When you upgrade to Windows 95, it converts your existing groups into folders in the \Windows\Start Menu\Programs folder, and you may have added other items to those folders since. Any changes you make to Group files will not automatically be reflected in the Programs folders.

You can update the Programs folders to any changes you make in the group files by running Grpconv.exe. Running Program Manager also means you'll miss out on important Windows 95 shell features such as nested program folders.

You may attempt to run Program Manager after being prompted to by some 16-bit Windows 3.x programs whose install routines mistake Explorer for a shell replacement like Norton Desktop. Don't fall for this: In our experience, Explorer can handle these install programs.

File Manager arguably has more going for it these days than Program Manager. In fact, it solves one of the great problems with Windows Explorer, namely the latter's lack of MDI support. Copying files from one directory to another in Explorer can be awkward, but with File Manager, you can just tile two Windows as you did in Windows 3.x. You don't need to run Program Manager in order to run File Manager. The major downside of using File Manager in Windows 95 is that, as a Windows 3.1x application, it does not see long file names.

Task Manager, new in Windows 95, is more feature-laden than the simple Task List feature in Windows 3.x and Windows NT. While it's larger and more intrusive than the Taskbar, and lacks a few of its features such as Minimize All Windows, you may prefer it if the Taskbar's icons appear too small.

BOOT CAMP

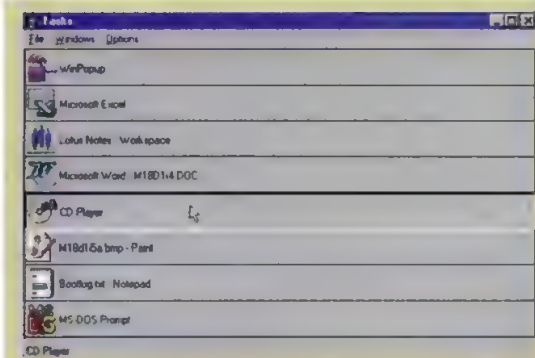
► Explore the Boot Options Menu.

When you power up your machine and allow it to start on its own, Windows 95 boots invisibly beneath a sky-blue bitmap. If you press the F8 key early in the boot sequence (before the logo screen appears), the system will display a DOS menu of boot options. These options allow you to edit your system configuration when Windows 95 is not functioning correctly.

The Normal option, of course, boots Windows 95 as it ordinarily would. The Logged (\Bootlog.txt) option is identical to the Normal option, except it creates an ASCII file called Bootlog.txt in the root directory. This file contains a log of all the drivers that your system attempted to load and the results of those attempts.

The Command Prompt Only option loads Windows 95 in a non-GUI format that is essentially MS-DOS Version 7; it runs in real mode and can only run DOS applications. From this interface, you can later move into protected mode and the full GUI by typing Win at the command line.

Several boot options involve Safe Mode, a version of Windows 95 that does not load protected-mode drivers. If your system contains an incompatibility, you are more likely to get Windows 95 up and running in Safe Mode. You can edit the system's configuration under the GUI, then reboot the system to test the effects of your changes. You cannot, however, use Safe Mode as a regular



The Task Manager (Taskman.exe) displays all of your open applications in a compact window. While Taskbar is running, Task Manager is redundant, but it is easier to read.

real-mode drivers for it as well. If you see lines in your CONFIG.SYS or AUTO-EXEC.BAT that load real-mode device drivers, and no evidence in System Properties that Windows 95 is using them, try commenting them out one by one with the REM statement. Windows 95 includes so many 32-bit device drivers that you may not need real-mode drivers at all.

► Optional: Load the Windows 3.1x UI.

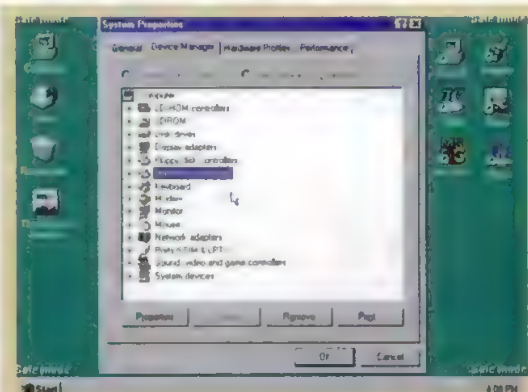
If you (or people in your organization) find the new Windows 95 interface too hard to manage, you can easily return to the staid comforts of the Windows 3.x UI. Windows 95 also comes with a new, enhanced Task Manager which some may prefer to the Taskbar. You can run Program Manager, File Manager, or Task Manager simply by selecting Start|Run and entering Progman, Winfile, or Taskman, respectively, at the command line.

You can even make Program Manager your default shell by editing the System.ini file. Yes, Win.ini and System.ini are still there, although they have less work to do under Windows 95 than they did in Win 3.x. If you want to edit any of the old DOS or Windows configuration files, the System Editor is still in Windows 95 and useful as ever. Just select Start|Run and type Sysedit.

Near the top of System.ini, in the [boot] section, you will find a line that says

```
shell=Explorer.exe
```

Change Explorer to Progman, restart the system, and you're back in 1992 with the Windows 3.x interface. Or almost.



A Safe Mode boot does not load any protected-mode drivers, but it still provides the familiar GUI. If your machine has configuration problems, it is more likely to boot in Safe Mode.

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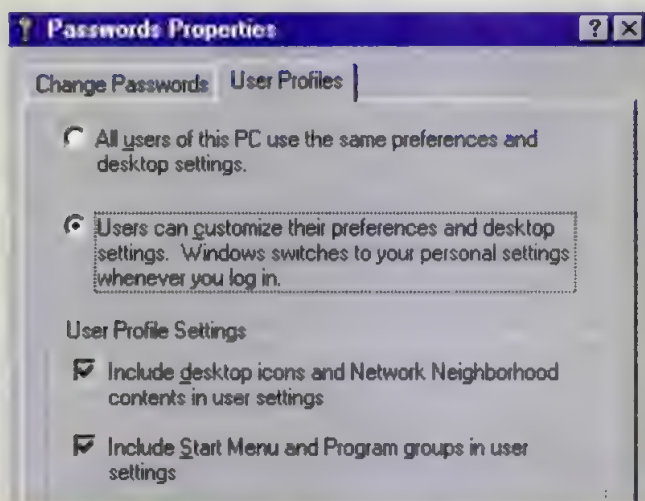
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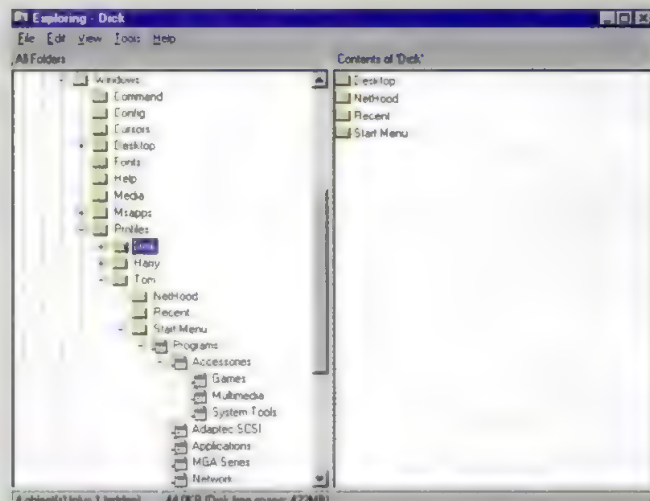
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Windows 95's User Profiles: How They Work



SETTING USER PROFILES: To allow multiple users, bring up the Passwords Properties dialog from Control Panel and click on the second radio button.



THE PROFILES FOLDER: Windows 95 stores each user profile as a subfolder in C:\Windows\Profiles. This system has three different users—Tom, Dick, and Harry.

means of operation. Since most hardware and software will not run without protected-mode drivers, you should move back to Normal mode once you change the diagnostics.

If you have installed network support on the system, Safe Mode with the Network Support option is the best way to deal with configuration problems. This option can be particularly useful when the system loads software off the network during the boot process. You can also enter a non-GUI Safe Mode by selecting Safe Mode Command Prompt.

The last major boot menu option is Step-by-Step Configuration, available since MS-DOS 6.0. Under this option, Windows 95 will ask for your approval before loading each driver or TSR. It is a tedious method, but sometimes it is the only way to solve a configuration problem.

► **Configure the new Msdos.sys.** In MS-DOS, the file MSDOS.SYS is a binary file that contains part of the DOS system code. In Windows 95, Msdos.sys is an ASCII file that lets you manipulate the boot process in powerful ways. While the most detailed Msdos.sys information source is the

Windows 95 Resource Kit, we will briefly cover a few of its commands.

Although Windows 95 is usually installed over an existing DOS installation, you cannot boot that version of DOS from the options menu. The best way to boot a previous DOS version is to add a line that reads `BootMulti=1` to the [Options] section of Msdos.sys. If this command is added, pressing F4 shortly after your machine powers on will boot your underlying version of MS-DOS. An option for this boot will also appear in the menu that is accessed via the F8 key.

After you start your machine, you usu-

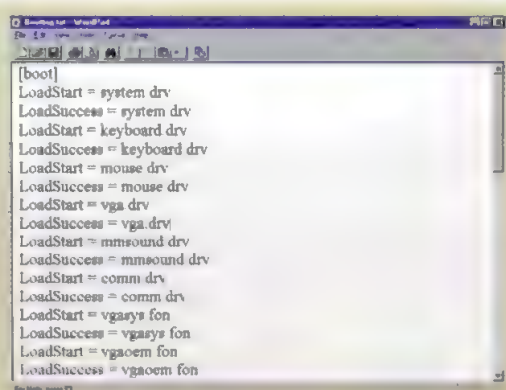
ally have two seconds to press F8 before Windows 95 defaults to Normal mode. If you want more time, you can add the `BootDelay=n` command to Msdos.sys, where n is the number of seconds you have to press F8. There is a similar setting, `BootMenuDelay`, which sets the boot menu time limit; you have n seconds to choose an option before the system boots normally.

If you want to boot without the aforementioned sky-blue bitmap, insert `Logo=0` into the [Options] section of Msdos.sys. The Command Prompt Only option can be accomplished via the `BootGUI=0` command, while the `BootMenu=1` command will bring up the boot options menu every time you start your machine.

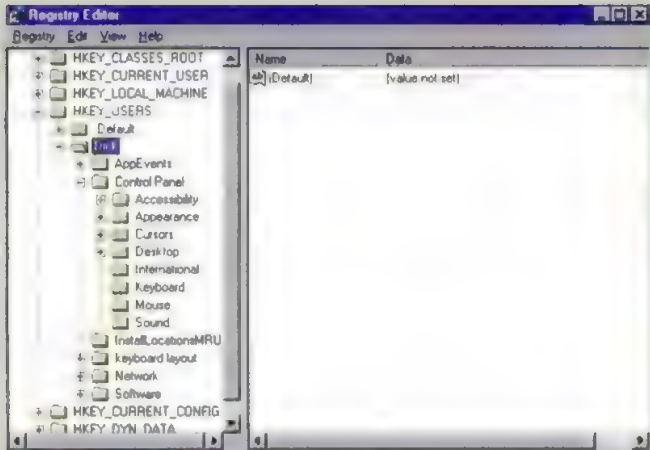
► Explore Bootlog.txt and Detlog.txt.

The file produced during a Logged boot, Bootlog.txt, is a very useful tool; if you read this file with a text editor, it will tell you if any drivers or VxDs failed to load during the boot process. Many times, such information will help you immediately solve your configuration problems, but it will also give you data for an intelligent technical-support call.

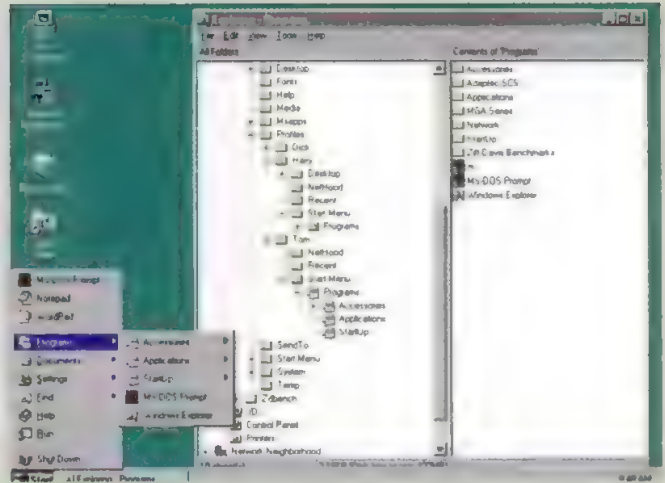
After a flawless boot, Bootlog.txt contains a pair of entries for each driver (Loading Device and LoadSuccess) and for each VxD (Loading Vxd and LoadSuccess). There are other entries for different opera-



When you opt for a Logged boot, Bootlog.txt records each attempt to load a driver or VxD. Reading this file is a good way to identify configuration problems.



PROFILES IN THE REGISTRY: A user's profile is also part of the system Registry. The Registry stores wallpaper, sounds, cursors, and other settings. Only the settings for the user currently logged on are visible during a given session.



CUSTOMIZED DESKTOP: One user can install software without other users having access. Tom, logged on here, has Programs folders different from Harry's. For others to access one user's software, copy the associated shortcuts into each user's Desktop or Programs folders.

tions, different devices, and failures.

Sometimes log entries in Bootlog.txt will identify an error with a just-installed hardware component or just-replaced driver. You can correct many of these errors on your own—at least temporarily. If you see a Load Device entry without a matching LoadSuccess entry, for instance, rename the file that the system is attempting to load. Your problems may dissolve once you disable this file, although you could also lose functionality.

You are less likely to find useful information in a second Windows 95 log file, Detlog.txt, also in the Windows folder. This file contains a log of the system's most recent boot-time hardware-detection phase. Among the many I/O queries and other commands, Windows 95 nests only a few interesting items. AvoidMem entries (which display the memory ranges that Windows 95 is not detecting for fear of hanging the system) and Error entries may pinpoint configuration problems.

Under Windows 95, most of the commands for the hardware detection phase reside in C:\Windows\Inf\Msdet.inf. After making a backup copy of this file, you can edit its contents so that Windows 95 will not attempt to detect the devices that are causing errors in Detlog.txt. Again, this may reduce functionality.

Most of the commands in Detlog.txt and

Msdet.inf, however, are analogs of entries in the Windows 95 Device Manager. Try to edit your configuration via the Device Manager before moving to these two files.

► Delete your configuration files?

Two files that were crucial to the Windows 3.x boot process, CONFIG.SYS and AUTOEXEC.BAT, are all but obsolete under Windows 95. Most Windows 95 users cannot wait to delete them at last. Deleting these files, however, can take away some of your flexibility. There are still some functions, such as setting the PATH and other environment variables, that are best executed via AUTOEXEC.BAT. Since Windows 95 does not exit to a DOS prompt, it is difficult to set global environment variables after AUTOEXEC.BAT has finished processing.

If you use only Windows 95 applications, you will probably not need AUTOEXEC.BAT. Windows 95 applications tend to store environmental information in the system Registry rather than the Environment, a DOS facility that never lived up to what it could have been. But you may want to run utilities like DOSKEY that are usually run from AUTOEXEC.BAT. Windows 95 DOS sessions, after all, can only get history when you are running DOSKEY.

If you delete your AUTOEXEC

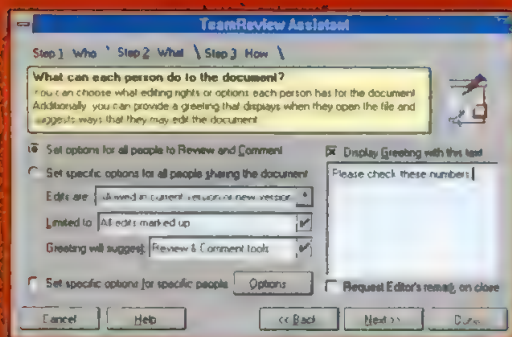
.BAT, there is one way to retain some of its functionality. Since Windows 95 allows you to run a batch file before any DOS program or session, you can run DOSKEY and set environmental variables from such batch files. Open the Properties dialog for the program you wish to run, go to the Program tab, and type the batch file's name in the Batch File dialog. It would be easier to enter these globally in AUTOEXEC.BAT, but you can have more detailed control of your environments with the batch file property.

PROFILES AND SECURITY

► Take advantage of user profiles.

With the Windows 95 User Profiles facility, you can set up multiple system configurations on a single machine. This facility not only benefits systems that have many different users, but can also benefit single users who require greater flexibility. Setting user profiles, however, is not entirely intuitive and can be troublesome.

To configure your system for multiple users, launch the Password Properties dialog from the Control Panel, select the User Profiles tab, and click on the second radio button: Users Can Customize Their Preferences and Desktop Settings. You should also check the two boxes under



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September 30, 1995

Mr. and Mrs. Arthur Sweetser
126 Squires Road
Marco Island, Florida

zip?
33969

Arthur's on vacation
until Oct. 15 - date it
+ send late that week.

Dear Arthur and Cindy,

I have reviewed your estate plan ^{with Rebecca} as reflected in your present Wills and the schedule of assets that you left with me. My comments and suggestions follow.

recently

Your present Wills provide the desired flexibility to determine after the first death the amount of marital deduction to be utilized in order to achieve the best federal estate tax result. A problem arises, however, by reason of the way you presently hold ^{COMBINED} assets. In the event Arthur is the first to die, his two IRAs and Annuity would pass to pursuant to the beneficiary designations in place, leaving no assets with which to produce a taxable estate and utilize any of Arthur's available unified credit. While there will be no federal estate tax payable on Arthur's estate, the tax in Cindy's estate may well be higher than it needs to be by reason of the failure to use Arthur's unified credit.

attach
design-
nation

Can we insert a table here?

To illustrate the foregoing, using the values contained on your Schedule of Assets, and assuming Arthur dies first and that Cindy dies one year later [#] with no change in asset values, Arthur's gross estate for federal estate tax purposes would be \$580,007.00 representing the sum of the two IRA accounts and the annuity. Assuming no administration expenses, there would be a marital deduction taken in the amount of \$580,007.00 since each of the assets making up the gross estate pass to Cindy, producing a taxable estate of -0-. Upon Cindy's death, her gross estate for federal estate tax purposes will equal \$2,432,012.00, representing the sum of the above assets received for Arthur, the investment account, her IRA, the primary residence, and the New

Can you give me
some backup?

-1-

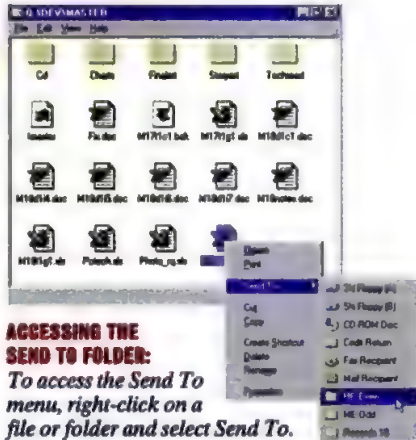
What are the
chances of this?

IS THIS TRUE?
PLEASE
CALCULATE

Adding Items to the Send To Menu



EDITING THE SEND TO FOLDER: The Send To menu allows you to dispatch files to places like folders, applications, utilities, and printers. If you manually add a shortcut to the Send To folder in C:\Windows, then Windows 95 automatically adds it to the Send To menu. Right-dragging any shortcut into the Send To folder gives you the option of copying it there.



ACCESSING THE SEND TO FOLDER:

To access the Send To menu, right-click on a file or folder and select Send To. The resulting menu contains the same shortcuts that you have added to C:\Windows\SendTo.

User Profile Settings, which allow each user to customize their Desktop icons, Network Neighborhood contents, Start Menu, and Program groups.

When user profiles are enabled, Windows 95 launches a user login dialog each time the system boots. If you enter a new user name and password, a second screen asks if you want to retain your settings for subsequent logins. If you click on Yes, Windows 95 creates a Profiles folder in C:\Windows and a nested subfolder that bears the new user's name. This subfolder contains a copy of the Desktop folder, the Start Menu folder, the Recent folder, and User.dat, which is used as part of the system Registry.

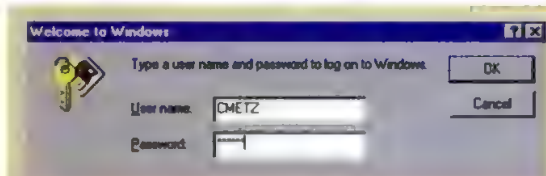
Every time this new user logs on, the system uses the files in C:\Windows\Profiles instead of the default settings. Any changes that the new user makes to the Start Menu, the recent documents list, and numerous other configuration parameters will not show up in the sessions of other users. Since the Registry contains a key for the current user, you can also personalize system features like color scheme and wallpaper.

If you press **Escape** at the Windows login screen, you can log on with the system's default settings. Because new users must start with default settings before customizing their profiles, you can create a profile template for all subsequent users. But you cannot easily apply those settings to users who already have created their

profiles. This rule also applies to software installations. If you install a new application, only the current user can access it. To make the software available to all other users, you must use Explorer to copy the application shortcut into each of the user's folders in C:\Windows\Profiles. Shortcuts can be placed in \Desktop or in \Start Menu, depending on where you want the icons to appear.

User profiles, however, can be very convenient in other respects. With multiple profiles, an individual can use one machine for several different tasks without having to plow through an unmanageable Start Menu. When developers are writing code, for instance, they have different system needs than when they are word processing or playing games.

Since different user profiles have different StartUp folders, you can automatically launch a group of programs on some occasions, but leave them un-



If your machine has multiple user profiles, Windows 95 brings up a password screen after each bootup. Be warned: This password will not protect your profile from other users on the machine.

opened on others. Laptop users who are at home, in the office, or on the road can benefit from user profiles, as well. You can create three separate profiles that display software that is particular to each location. Your office profile can contain your network applications, while your home profile contains games for your kids.

► **There is no security.**

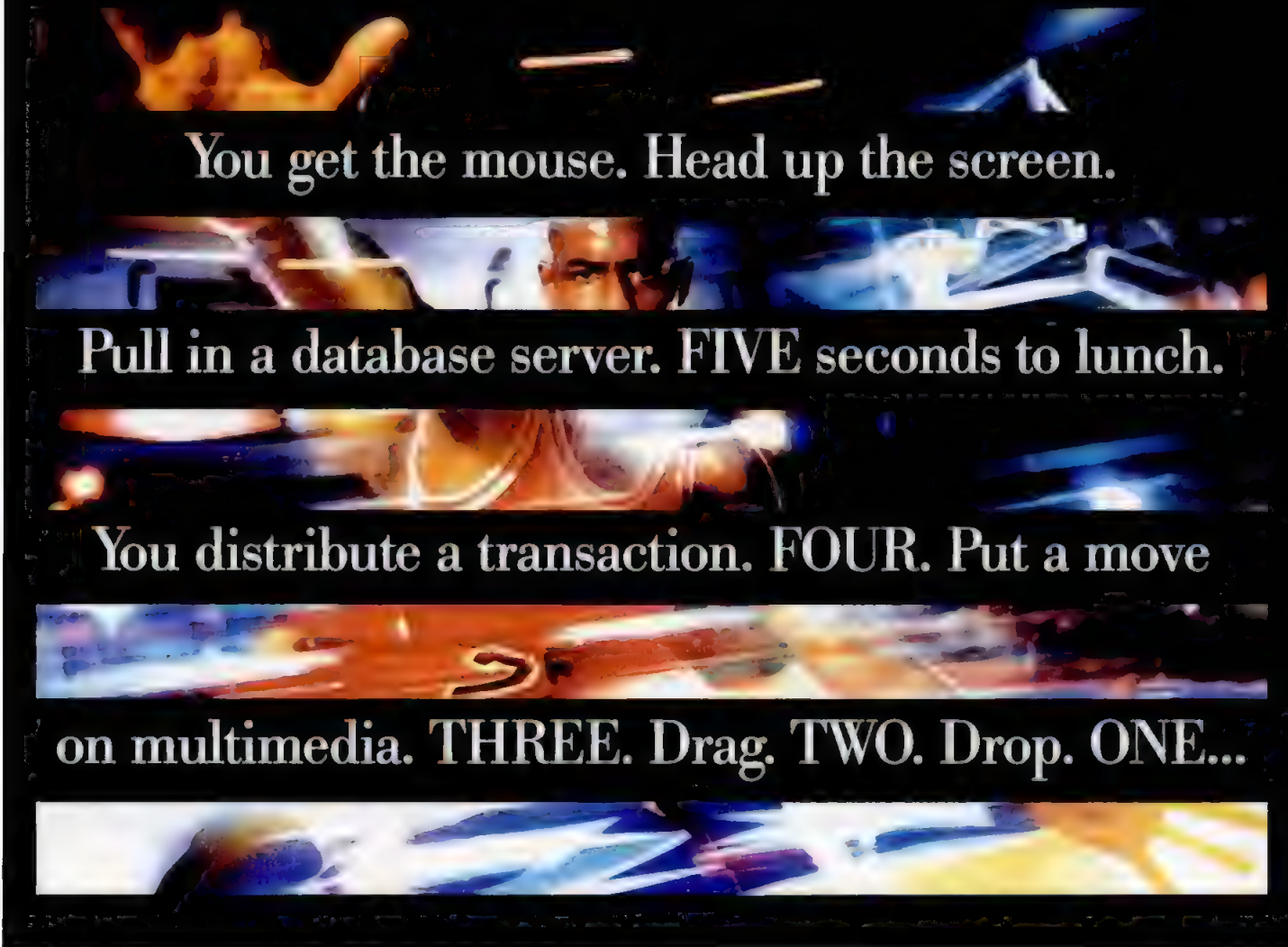
A profile can only be accessed with a valid password, but this does not mean that your profile is protected from other users. Be warned: These passwords supply no security. Windows 95 is not a secure operating system and was not built to be one. As an example of how insecure things really are, any user can modify or completely delete the profiles that are kept in C:\Windows\Profiles. For that matter, any user can simply reformat the hard disk.

User Profiles, however, can tie into the user security managed by a NetWare or Windows NT server. At that point, Windows 95 can keep the local hard disk secure from specific remote users by relying on the servers' security mechanisms. Without such a server on the network, Windows 95 systems are vulnerable to all users that share the hard disk.

► **Global vs. local: Keep them straight.**

Before you set up multiple profiles, you need to know which system characteristics are user-specific and which are global. The Dialing Properties information, such as the system location, is global. If this were local, it would be easier to keep profiles for users who are logging in from different locations. Some desktop characteristics are also global. Global folders such as My Computer, Network Neighbor-

hood, InBox, and Recycle Bin can have different desktop locations in different profiles, but their names and their icons always remain the same. If one user changes them, then the changes will show up in all other user profiles. The addition and deletion of other folders or shortcuts on the desktop, however, is always specific to each profile.



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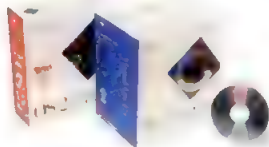
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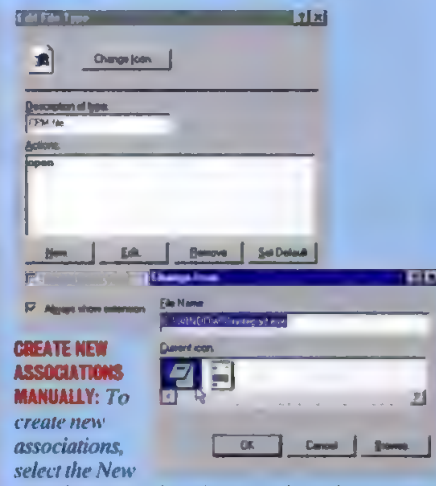
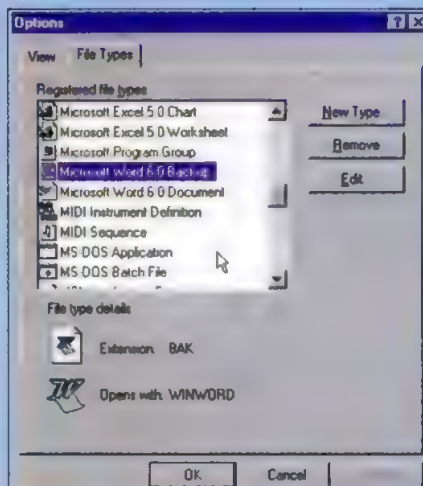
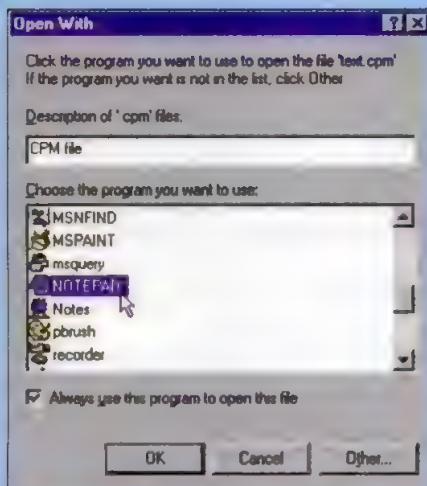
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Associating Applications with File Extensions



CREATING ASSOCIATIONS THE FIRST TIME: If you try to launch a file with an unrecognized extension, Windows 95 brings up the Open With dialog. To associate the extension with a particular app, enter a description of the file type and choose an executable from the dialog's pre-defined list.

BROWSE YOUR ASSOCIATIONS: To see current file associations listed, choose View|Options in Explorer. Click on the File Types tab. If you highlight an association, its file extension and allied executables are listed at the bottom. To associate multiple extensions with one application, you must create multiple File Types.

SHELL TRAPS AND TRICKS

► Know your Windows 95 file types.

File Associations, which connect applications with file extensions, were a useful but limited feature in Windows 3.1. Associations made it possible to double-click on a document in File Manager or Program Manager and have it automatically open under the appropriate application. Under Windows 95, however, you can open files directly from the Desktop and from folders, as well as from Explorer. The Windows 95 dialogs that create File Types—the Windows 95 version of Associations—are slightly puzzling, but they are extremely beneficial once you learn their nuances.

If you right-click on a file with an unassociated extension, the resulting Open With option lets you select the application that you wish to use to open it. If you want to associate the application permanently with this file's extension, you must also check a box at the bottom of the dialog. This box reads Always Use This Program To Open This File, but it actually assigns the program to all documents of this file type. You can key in a description for the file type, or default to the extension name.

To view your existing file types, select View|Options in Explorer and move to the File Types tab. When you highlight a type, a details box at the bottom of the tab displays the associated extension and application. If you assigned several extensions to one application under Windows 3.1, they will be retained in a single association when you upgrade to Windows 95. New associations, however, are limited to one extension. If you want to associate several extensions with an application, you must create a new file type for each.

You create new associations from the File Types tab by clicking on the New Type button. Under the Add New Type dialog, enter an extension, a description, an icon, actions (typically open), and the application to perform the actions. When you right-click on a file with the specified extension, all of its actions are listed in the resulting context menu. The default action (the action that results from a double click on the document) is in bold.

► Customize the Start Menu.

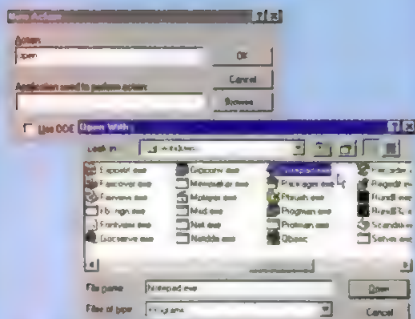
The Windows 95 Start Menu is well named. Every day, you initiate myriad actions by clicking on it and navigating its cascading submenus. Consequently, you

should take the time to customize the Start Menu for your needs.

Simple customization is fairly easy. You can add programs or document shortcuts to the Start Menu by right-clicking on the Taskbar, selecting Properties from the resulting context menu, choosing the Start Menu Programs tab, and selecting Add. The Wizard that pops up lets you browse a file or document and place it on the Start Menu. If you simply drag a program or document onto the Start button, however, you can insert its shortcut into the menu much faster.

Individual shortcuts in the Start Menu can be helpful, but they are often harder to access than shortcuts that are right on the Desktop. A customized Start Menu is only advantageous if it makes application or document access quicker and easier. You can accomplish this by creating your own cascading submenus within the Start Menu.

Suppose that you have a Work folder on your Desktop that is full of subfolders and documents. To access a file that is nested deep within this folder, you must manually open several windows to get to it. If this folder was part of the Start Menu, however, you could effortlessly



THE NEW ACTION DIALOG: After you select *New* under *Edu File Type*, you can enter associated applications in the *New Action* dialog. Enter the *Action* name (which becomes part of the context menu of associated files), then input the command line of the executable you wish to use. You must add an application-specific switch to the command line if you don't want to open a new instance of the executable each time you launch a new associated file type.

cascade to such a file. Adding such a Work folder to the Start Menu is a simple process. First, create a shortcut to the folder on the Desktop. Next, right-click on the Start button and choose *Explore*, which opens Explorer with the Start Menu folder as the current focus. Finally, drag the actual Work folder into the Start Menu folder.

When you click on the Start Button, you will be able to access a new cascading submenu that displays the entire contents of your Work folder. If you want to add new items to the folder, access it with your Desktop shortcut. Any changes you make will be reflected in the Start Menu.

► Find the files you need.

The only real way to visualize the contents of your system is to use the Windows Explorer (or My Computer or Network Neighborhood, which use the same executable code). The Explorer is powerful, but it has some annoying quirks. For one, you cannot directly use it to view or select files of a certain type—all *.XL* files in a certain folder, for instance.

To view files of a single type, you must access the separate Find utility, which you can launch from within Explorer by se-

lecting *Tools|Find*. Find lets you use wildcards and sort the results by file attributes. Since My Computer and Network Neighborhood do not have a direct link to Find, you should not use them to manage groups of files—even on a network. If you must use them, *View|Arrange Icons|By Type* gives you a quick and dirty sort, but only by file extension.

► Recover lost Windows.

The Taskbar is a big leap forward in task switching. Since most running applications and open windows generate a Taskbar button, switching to any active task requires nothing but a mouse click. Unfortunately, most Control Panel applets, Wizard screens, and property sheets do not produce Taskbar buttons when they execute.

It's easy to lose these items in the background if an application is running full-screen or if your desktop is cluttered with Windows. To bring a non-Taskbar window back to the foreground quickly, right-click on the Taskbar and select *Minimize All Windows*. All windows obediently oblige—except the non-Taskbar windows, which are left alone on the screen.

► Configure the Send To menu.

The Send To menu is one of the most potentially convenient options in a file's context menu. (This results when you right click on a file.) It lets you perform common navigation chores, like copying a file to a floppy disk, that are annoyingly cumbersome using Explorer. By default, Send To's target options are your floppy drives

(Briefcase and Mail Recipient may be there depending on your installation). You can customize the Send To menu easily to include many other useful targets, including applications, folders, devices, and utilities.

To edit your Send To menu, launch Explorer and locate the *C:\Windows\SendTo* folder. In this folder, you will see a set of shortcuts that correspond to the current contents of your Send To menu. You can customize the menu simply by adding new shortcuts to the folder. Helpful items to add include faxes, local or networked printers, the folders you use most often, and utilities like the Recycle Bin.

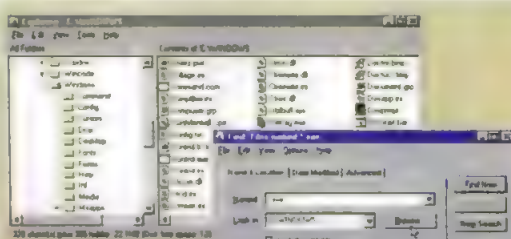
MOBILE COMPUTING

► Make the most of the Briefcase.

For mobile users, the Windows 95 Briefcase is one of the operating system's strongest tools, but it has several little-known features and a few quirks. If you selected *Typical* during the install process, you must add Briefcase from the Accessories section of Control Panel's *Add/Remove Programs* applet.

Briefcase allows you to copy files from your machine onto a floppy disk, modify those files when you are away from your machine, and then update the original files when you return. Once you install Briefcase, open it up and drag in the files that you wish to take on the road. Next, drag the Briefcase itself to your floppy disk drive. This does not copy the folder, as a typical drag would; it actually moves the entire Briefcase to the floppy disk drive—including *desktop.ini*, the Briefcase database, and files that you copied into it. Briefcase can also be used over Direct Cable Connect, a network, or even between folders.

Be careful, however, when you move Briefcase to a floppy disk. If your floppy disk runs out of space, the Briefcase will be stuck in limbo: Half is on the desktop, and half is on your floppy disk drive. The half on your desktop is inoperable and cannot be used successfully again. If you delete this half, the other half on your floppy disk operates normally, but it will



To search the Windows Explorer for a file, or for a group of files, select *Find* under Explorer's *Tool* menu. This applet will search the folder that is currently highlighted.

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SERVICE WITH
MOST PCs. THE
QUESTION IS,
HOW MUCH?**

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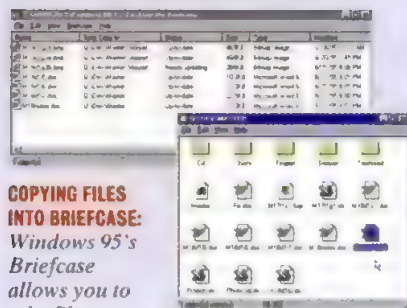
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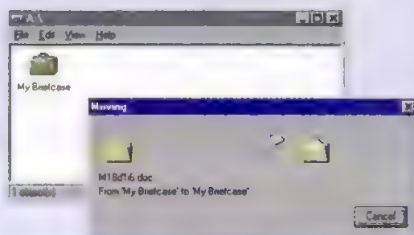


Briefcase on the Road

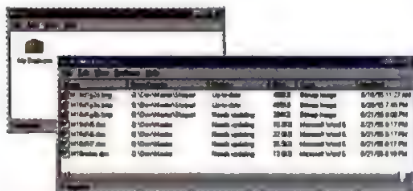


COPYING FILES INTO BRIEFCASE:

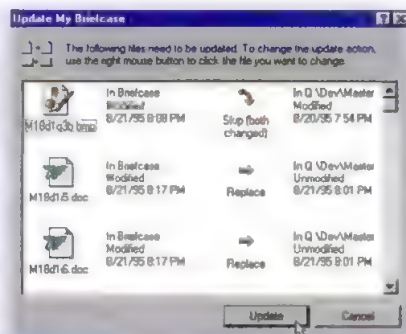
Windows 95's Briefcase allows you to take files on the road, modify them, and automatically update the originals when you return. You can manually copy your network or hard disk files into Briefcase or use the Send To menu, which contains a Briefcase shortcut.



MOVING A BRIEFCASE TO A FLOPPY DISK: Once you've copied your files into Briefcase, drag it to a floppy disk. This moves your files, as well as the Briefcase itself. Should you lose this floppy disk, you can create new Briefcases by right-clicking on the desktop and selecting New. You can rename your Briefcases as you would any other folders.



RETURNING FROM THE ROAD: While on the road, you can edit your Briefcase files just as you would at the office. After returning to your office machine, insert your floppy disk and click on Briefcase. Briefcase then tells you which files have not changed and which need to be updated. If both the original and copy have been modified, Briefcase prompts you to skip the update but gives you the option of overwriting either version with the other.



UPDATING FILES: If you select Briefcase\Update All from the Briefcase file menu, a dialog gives you information about the files that will be updated. Click on Update and the changed versions on your floppy disk are copied over the originals on your network or local hard disk files.

not contain all the files you wanted.

Once Briefcase is on the floppy disk, you can take it anywhere and modify your files as you would from a regular folder. When you return to your machine, insert the floppy disk and reopen Briefcase. Any modified files are listed with a Needs Updating tag. To update the original files, select Briefcase\Update All (which displays detailed information about the original and the modified copy) and click on Update. Your modified files are then copied into the originals. If both files have been changed, Briefcase defaults to skipping the update. To override this and update whichever version you choose, right-click on the file icon and select the direc-

tion of the update. Briefcase cannot reconcile differences between two files.

You can also disassociate the two copies of a file. When you select Briefcase\Split From Original, the two files are separated (although they retain the same name), and no longer support the Update function.

Since you must move Briefcase from your desktop to a floppy disk when you take files on the road, your system will no longer have a Briefcase if you lose the floppy disk. If this happens, your first instinct may be to reinstall it from the CD-ROM. When you bring up Add\Remove programs, however, it no longer lists Briefcase if you have previously installed it. Don't worry. To create as many new

Briefcases as you wish, right-click on the Desktop, access the New menu, and select the Briefcase entry.

When you install Briefcase for the first time, Windows 95 also adds its shortcut to your Send To menu. Most users fail to realize this and waste their time by manually copying files from window to window. With the Send To menu, all you need is a right-click on the file you wish to copy.

► Hook up with Direct Cable Connect.

Direct Cable Connect (DCC) is another prime feature for mobile users that is not included in a Typical install (select it from the Communications section of Add\Remove Programs). It lets you temporarily network a guest computer (typically a laptop) to a host (most likely an office PC).

When connected, the host shares directories or resources with the guest. Using standard graphical tools such as Explorer and Network Neighborhood, you can handle the shared directories and resources from your guest computer as if they were on its own hard disk. If the host is on a network, the guest can access your network files as well. DCC connects the host and guest machines via a 4-bit LapLink-style cable, an EPC parallel cable, or even a serial cable and a null modem.

Once you have installed DCC, choose Program\Accessories to launch the applet. The first time you use DCC, a Wizard handles most of the setup process, although it may prompt you to carry out certain steps using other Windows 95 modules. You must run a common network protocol on both the host and guest, and enable print and file sharing (bring up Control Panel's Networking dialog to confirm both of these criteria). DCC asks you to specify one particular system as the host and one as the guest, although you can always change this configuration later.

You also need to define what host resources you wish to share with the guest. To set up shared host resources, run the host's Explorer, highlight a directory you wish to share, select File\Properties, and move to the resulting dialog's Sharing tab. Selecting the Shared As radio button lets you specify the share name that the guest

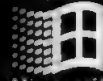
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CIRCLE 304 ON READER SERVICE CARD

PC will see. If you are on a NetWare network, clicking the Add button brings up server-based user and group security information, which you can use to control network access to your shared resources. The DCC Wizard lets you set up password security between the host and guest, as well.

Once you have set up DCC properly and connected the host and guest with a parallel or serial cable, launch the connection applet on the host and then on the guest. If you have specified a password on the host, a dialog prompts you to enter it. Your network log-on prompts appear, letting you connect the guest machine to the network. When the two machines are connected, the host will appear as a server in the guest's Network Neighborhood. Clicking on this host displays the shared resources that you configured in the host's Explorer. You can now drag and drop files from either system to the other.

If you use a DCC connection for anything more than quick file transfers, you should establish drive mappings on the guest for the host's shared resources. This must be done if you want to use 16-bit guest applications to access host files. To map new drives, open Network Neighborhood, choose the desired host resource (the host's C:\Files directory, for example), and click on the Map Network Drive button from the toolbar (select View/Toolbar if the toolbar is not visible). You can select a drive letter from the pull-down listbox, but you must also enter the precise UNC path of the resource since there is no Browse facility. Drive mappings can be saved by checking Reconnect at log-on.

DCC is not exactly the easiest part of Windows 95 to learn, but you'll find it is well worth your while to try. You can attach your portable computer to a host system in under a minute and enjoy a reasonably high-speed connection to your host PC and your network. You can drag and drop files in any direction between host, guest, and network, and you can use host or network resources from applications running on the guest. DCC's unique ability to map host resources to drive letters on the guest elevates it to the status of a true network connection.

NETWORKING NUANCES

► **Share files without losing control.**

With Windows 95 peer-to-peer networking, you can share your own files and resources with other clients that are running Windows for Workgroups, Windows NT, OS/2 Warp Connect, or Windows 95. Before you share your hard disk, CD-ROM, or printer across your network, however, you should become familiar with the process and the consequences.

To install the peer-to-peer services on your system, bring-up the Network dialog from Control Panel, move to the Configuration tab, click on Add, and select Client. Within the resulting Select Network Client dialog, highlight the Client for Microsoft Networks and click on OK. Once you restart your machine, the Network Neighborhood will display all clients in your workgroup that are sharing their files. Network Neighborhood also lists your network's Microsoft, Warp Connect, and IBM LAN Server domains, Microsoft workgroups, and NetWare servers via their Universal Naming Convention (UNC) monikers, but not their drive mappings.

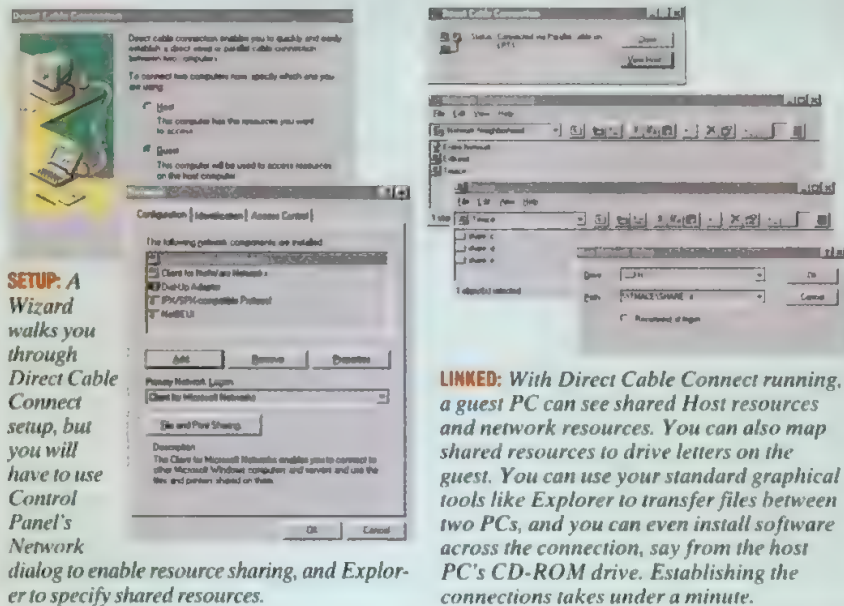
If you want to share your own files, set the File and Print Sharing options under the Configuration tab, and select Share-Level Access Control under the Access

Control tab. To configure your sharing options, you must return to the Desktop or Explorer; right-click on the resource you wish to share (hard disk or CD-ROM, for example) and bring up the Sharing dialog. If you are not on a NetWare network, either everyone on your network can access your files, or no one can.

If you share your files on a network that is connected to the Internet, people all over the world can gain access to your hard disk. Fortunately, Windows 95 warns you if you try to share files on an IP network and offers to disable the sharing. You can configure read-only access, full access, and password protection for your shared files, but this will not guarantee tight security. If you are on a Windows NT LAN, however, greater and more specific protection is available. After selecting User-level Access Control within the Network dialog's Access Control tab, you can choose which users you want to grant access to and how much access you want them to have. You can also use User-level Access control over NetWare, but File and Print Sharing for NetWare Networks cannot run concurrently with Windows file sharing.

Making your files available on IPX and NetBEUI networks can also be a tenuous situation. In a large enterprise, network administrators do not usually ap-

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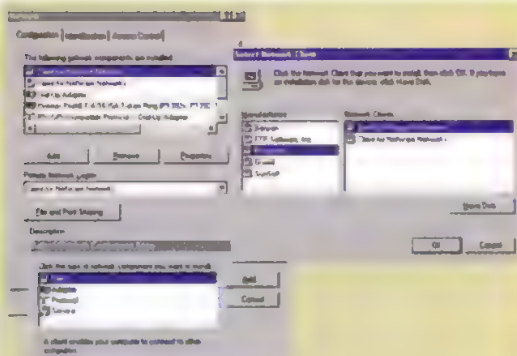
What's more, the new TI Extensa 550 uses the same PCI circuitry found in most desktop models for blazingly fast video monitors and improved disk drive performance. The new TI Extensa 550 also comes with a serial infrared port, which lets you print or share files, wirelessly. Thus enabling the new TI Extensa 550, and its owner, to do some extraordinary things.

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CIRCLE 353 ON READER SERVICE CARD



To install peer-to-peer networking, click on the Add button in Control Panel's Network dialog, open the Client window, and select the Client for Microsoft Networks.

preciate servers that pop up without permission. Administrators may want to take advantage of Windows 95's ability to create policies, which standardize configuration parameters and restrict access to certain features. You can deny access to the Network dialog, for instance, and remove a user's ability to share files.

► Streamline log-ons and passwords.

The Microsoft client for NetWare is robust, but you will encounter several problems with log-ons. All of these can be easily corrected.

Each time you log in to a NetWare server, Microsoft's NetWare client automatically executes your login scripts. Login scripts are batch-like files that run

(Nwlsproc.dll) does display your executing script in a window, but the script moves too quickly to be seen. You can solve this problem by inserting a Pause command in your user script, which executes just after the system login script. To edit your user script, run NetWare's Syscon utility, click on User Information, select your username, and then select Login Script.

NetWare passwords can also be troublesome under Windows 95. If your NetWare client is also on a Windows network or uses User Profiles, you must use both a NetWare password and a Windows password. You can, however, configure a single log-on for both networks.

After you log in to Windows 95, it automatically sends your Windows username and password to NetWare. If you make both usernames and both passwords the same, you will not have to endure two log-ons. Of course, you only get this unified log-on when you use Microsoft's NetWare client.

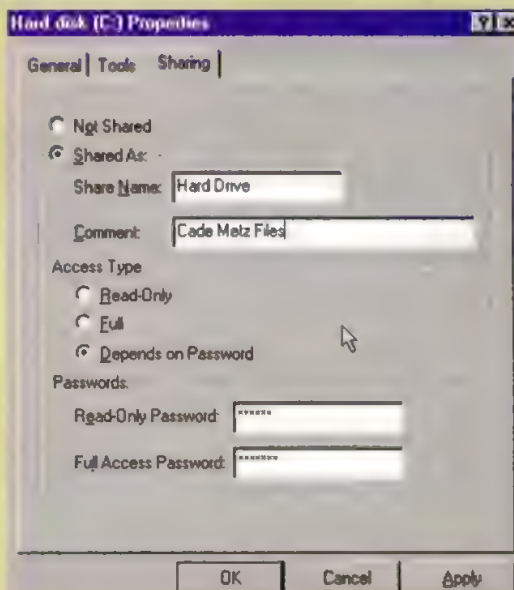
Windows 95 does have a convenient central Password applet in Control Panel, but it is essentially useless for NetWare. To change your NetWare password, you have to use the NetWare SETPASS

command in a DOS session. If you create a batch file that runs SETPASS and place a shortcut to it on the Desktop, you can quickly and easily change NetWare passwords.

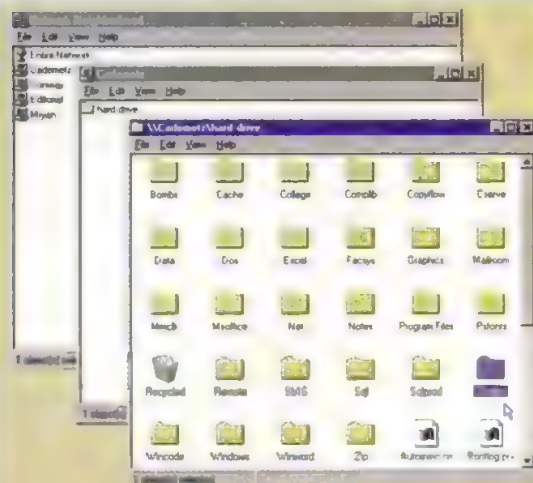
► Steer clear of long-filenames traps.

Windows 95 supports long filenames on a FAT drive, but you may encounter some problems when using them. Unfortunately, DOS applications, Windows 3.x applications, and NetWare servers without OS/2 Namespaces do not support long filenames.

You should also be aware that long filenames will be lost if you modify your



The Network dialog does not let you configure peer-to-peer sharing options. You must right click on the item you wish to share and select Sharing from the resulting menu.



After installing the Microsoft Client, all peer-to-peer servers will appear in the Network Neighborhood. When you click on a server and enter the correct password, all of its shared files are displayed.

Windows 95 documents with 16-bit applications running under Windows 3.x. This is a common scenario where files are accessed by multiple users on a network, some of whom are still running older Windows versions.

If you try to open a file that has a long filename using a Windows 3.x application, all you'll see in the Open dialog is a short alias (like Myfile~1.doc). If you open and modify the file, the long filename information will be lost for good. When you try to open it again using a Windows 95 application, all you'll see is the cryptic alias. You can also lose long filenames if you transfer files between Windows 95 and Windows 3.x systems on floppy disks.

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CIRCLE 368 ON READER SERVICE CARD

If you want to use Windows 95 to store long filenames on a NetWare server, the server must have OS/2 Namespace loaded. Unfortunately, this does not always work on NetWare 3.1.1 or earlier (Version 3.1.2 fixed this problem). To avoid data corruption, you must upgrade your server to NetWare 3.12 or 4.x, or disable long filenames on all NetWare drives. The former solution is a daunting task for most network administrators, but you can easily accomplish the latter by adding the following lines to your Win.ini file:

```
[NWRedir]
supportLFN=0
```

In doing so, you will lose one of the major advantages of Windows 95 on networked drives, but at least your data will be safe.

RUNNING DOS PROGRAMS

► Where are my .PIF files?

At first glance, it's not clear how Windows 95 is supposed to handle DOS software. Former Windows 3.x-users often look for their .PIF files and the .PIF editor, but are unable to find them. Although .PIF files are still used in Windows 95, the Windows Explorer hides their extensions. In fact, configuring DOS applications with .PIF files is not so complicated: When you create a shortcut to any DOS executable (.EXE, .COM, or .BAT), Windows 95 automatically creates a .PIF file for it.

You will not, however, find a PIFEDIT.EXE applet for editing these files. Instead, when you use the Windows Explorer to examine the properties of a DOS executable or its shortcut (in other words, its .PIF file), the Properties dialog allows you to modify all the parameters you're used to working with, plus some powerful new ones. Right-clicking on the icon of any DOS application or its shortcut and selecting Properties from the resulting context menu brings up the Properties dialog.

Here, you can specify the DOS program to launch, a working directory, any batch files to execute, the fonts used in the DOS box, and conventional, expanded, and extended memory settings for the session. You can set the program to run full-screen or in a window, adjust its idle sensitivity, and control a variety of

other settings for the virtual DOS session it runs in.

► Leverage MS-DOS mode.

Some programs will still resist your best efforts to configure them. Microsoft's own compatibility tests have shown that there are many DOS-based games which will not run in a normal DOS box under Windows 95. To run them, you must use Windows 95's new MS-DOS Mode.

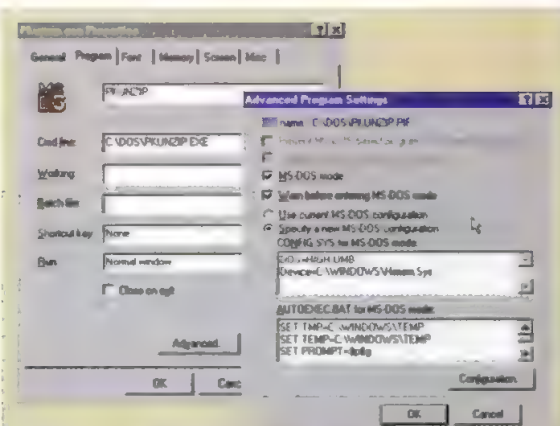
When you launch a DOS program configured to run in MS-DOS Mode, Windows 95 first shuts down all your running applications and restarts the system into real mode. It then boots a DOS session for your application to run in. While you're in MS-DOS mode, the graphical shell, multitasking, and protected-mode drivers are all unavailable. When you exit the application (or type Exit at a DOS prompt), Windows 95 restarts into protected mode.

To configure a DOS application to run in MS-DOS mode, you need to access a well-hidden dialog in the DOS program Properties editor. Right-click on your DOS program's icon or its shortcut (.PIF file), select Properties from the resulting context menu, select the Program tab in the properties dialog, and click on Advanced. If you check the MS-DOS mode check box, the application will always run in this mode.

► Achieve better DOS configuration.

Even if your applications do not require MS-DOS mode, you may want to use it anyway. MS-DOS Mode is the only way you can enter specific CONFIG.SYS and AUTOEXEC.BAT entries for a single application. Once you've checked the MS-DOS mode box, you can choose the current MS-DOS configuration or specify a new one. If you select the latter, you can then enter lines for CONFIG.SYS and AUTOEXEC.BAT files in the dialog.

This feature is a tolerable, if complicated, way to get around the fact that MS-DOS does not allow access to devices that normally use protected-mode drivers. If you are using Windows 95's protected-



To run a program in MS-DOS mode, right-click on it, select Properties, move to the Program tab, and click on the Advanced button. You can use the existing configuration or specify a new one.

mode CD-ROM drivers, for instance, you won't have access to your CD-ROM in MS-DOS mode—a big problem for a lot of games. The solution to this problem is to include the real-mode CD-ROM drivers and MSCDEX in the CONFIG.SYS and AUTOEXEC.BAT for that session. You won't have access to any of these drivers, however, if you merely boot to a command line during startup. Ironically, in order to load your real-mode drivers, you'll first have to load your protected-mode drivers and then unload them (unless you load the real-mode drivers globally in the system's CONFIG.SYS).

Another handy new feature for DOS software is the batch file property. On the Program tab of a DOS application's Properties dialog, you will find a line labeled Batch file which specifies a batch file that Windows 95 will run in the application's virtual machine before actually running the application. If your application has associated TSRs, this is a handy place to load them. This is also a potential spot to set environment variables which only that application needs.

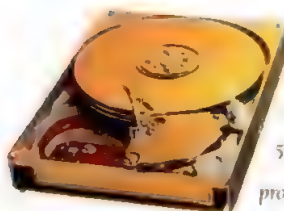
GET TO THE INTERNET

► Why did I lose my Internet access?

Unlike previous versions of Windows, Windows 95 ships with its own TCP/IP software. You can directly connect to the Internet over your LAN, or dial in via a modem and a phone line. This high degree of connectivity makes it all the more surprising if installing Windows 95 makes



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CIRCLE 386 ON READER SERVICE CARD



you lose the Internet connection you had. Unfortunately, this is a common scenario if you are using Internet access tools such as CompuServe Internet-in-a-Box, or NetMange's Internet Chameleon.

The problem lies with the Windows Socket (Winsock) support built into Windows 95. Winsock provides a standard interface that lets Windows applications like your Web browser talk to your TCP/IP protocol stack. If you elect to install the Microsoft Network, Dial-Up Networking, or Windows 95's TCP/IP, Windows 95 copies its own Winsock.dll in place of the Winsock.dll file from your Internet access tool. This new Winsock may not provide the same functionality as the one it replaced.

The best medicine is prevention. Before you install Windows 95, copy your old Winsock.dll to a nonsystem directory so you can replace it if needed. If Microsoft's Winsock.dll has already been installed, your old DLL may have been renamed in the process. If so, you can reenact it with a simple name change.

► Connect to third-party Net providers.

If you use the Microsoft Network as your provider and have purchased the Microsoft Plus! Pack, dialing in to the Internet is almost hassle-free. If you want to use CompuServe or another third-party provider however, the process is more complex. As an example, here's how to configure Windows 95's Dial-Up Networking to use CompuServe Internet access. You begin by installing TCP/IP.

To do this, bring up the Network dia-

log from Control Panel, click on Add, and select Microsoft TCP/IP from the Protocol window. Once installation is complete, right-click on TCP/IP->Dial-Up Adapter and access its Properties dialog. Using this dialog, you must then manually configure the appropriate TCP/IP information.

First, check Client for Microsoft Networks under the Binding tab, select the Obtain IP Address Automatically radio button under the IP Address tab, and check Set This Protocol To Be The Default Protocol under the Advanced tab.

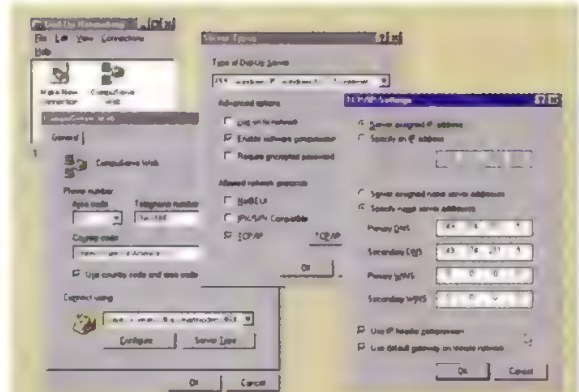
If you are using CompuServe, type 198.4.6.2 into the Gateway tab, then move to the DNS configuration tab. Here, you list the host and domain names as CompuServe.com and insert these two addresses into the DNS Server Search Order: 149.174.213.5 and 149.174.211.5. If you are using a provider other than CompuServe, you need to obtain the correct gateway and domain information from that provider.

A few seconds after you complete this setup, Windows 95 will bring up an error box saying that the DHCP client was unable to obtain an IP address from a DHCP server.

This error occurs because you have requested an automatic IP address but have not yet connected to the server that will supply it. Click on Yes to disable future messages and move on. Once you dial in to your provider's server, you will dynamically receive an IP address.

If you do not have Dial-up Networking loaded, install it from the Windows 95 CD-ROM via the Add/Remove Programs applet that resides in Control Panel. Once you reboot, you can access the Dial-up Networking folder from either My Computer or the Windows Explorer. To create a connection to CompuServe or another service, click on the folder and select Make a New Connection.

After clicking on the modem

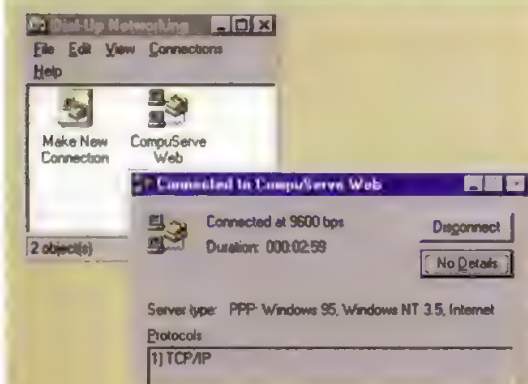


To configure Dial-Up Networking for an Internet provider such as CompuServe, you need to have the correct gateway and domain information.

Configure button, set parity to None, data bits to 8, and stop bits to 1 under the Connection tab, and check the Bring Up Terminal Window After Dialing box. When prompted for a phone number, enter the number that you usually use to dial in to CompuServe or another provider.

This process creates a new icon in your Dial-up Networking folder. To set the appropriate TCP/IP information, bring-up this icon's Properties box and click on Server Type. First, set the Dial-Up Server to PPP: Windows 95, Windows NT 3.5, Internet, and check *only* TCP/IP under allowed network protocol. You must then click on the TCP/IP settings button and reenter much of the information that you entered into Control Panel's Network dialog: Select a Server-Assigned IP-Address, specify the DNS server addresses (149.174.211.5 and 149.174.213.5), enable IP compression, and set up use of the default gateway on the remote network.

When you double-click on your new dial-up icon, your modem dials into the CompuServe server and a Terminal window pops-up. To log on, immediately press Enter. Since CompuServe typically starts in 7-bit mode, the characters on the screen are very cryptic, but this does not last long. After keying in your host name (CIS for CompuServe), ID number, and password, type GO PPPCONNECT and press F7 to exit Terminal. Finally, a small dialog tells you that you are connected to the Internet and displays your connect time. From this point forward, you can use any of your TCP/IP tools without interruption. □



Windows 95's Dial-Up Networking supports PPP, letting you use TCP/IP to connect to third-party Internet providers such as CompuServe.

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CIRCLE 136 ON READER SERVICE CARD

DOCUMENT/IMAGE MANAGEMENT



We took an informal survey and found that more people believe in Santa Claus than believe that there will ever be a paperless office. Even as we create tools that obviate the need for paper, such as e-mail and fax-modem transfers, we see other tools encouraging the use of more paper: improved word-processing and desktop-publishing packages and high-speed printers with huge paper capacities.

So we reluctantly acknowledge that we'll continue to use plenty of paper, and we move toward the task of managing it all. In the large-scale enterprise, tools to deal with the problem—such as expensive document-imaging systems and high-speed scanners—have been available for some time. But until recently, the pickings for the small office have been relatively slim, and the prices of hardware—scanners and storage—too high. The collection of tools represented in the following pages and the plummeting prices of hard disks have combined to change all that.

Ending the Paper Chase

By Ben Z. Gottesman

Why wait until you can't see over your desk to get organized? Personal scanners and document/image management software can help you level those paper mountains in a hurry.

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<i>LaserFiche Desktop</i>	<i>Delrina WinFax Scanner</i>164
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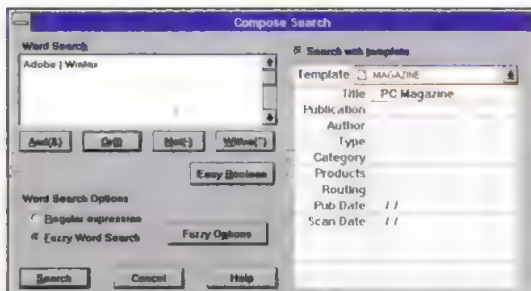
Highlights: Personal Document/Image Management



Things We Liked...



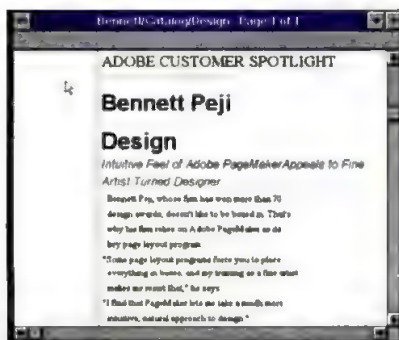
A PARALLEL ADAPTER lets you use the Pentax DS6 without the proprietary card.



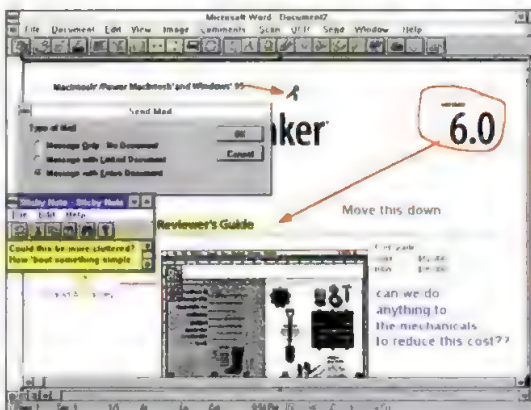
THE SHERLOCK HOLMES of search dialogs. LaserFiche includes full Boolean, fuzzy, and indexed searches, making sleuthing for your information elementary, my dear.



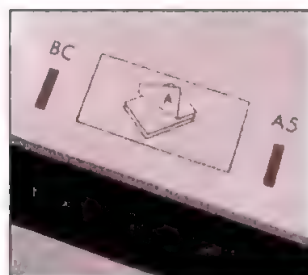
DOCUMENT AND PHOTO BUTTONS on the upper right corner of UMAX's PageOffice reduce the time it takes to scan.



IS IT REAL OR IS IT NEWSPRINT? PageKeeper's OCR transmogrifies paper documents into a near-exact electronic replica.

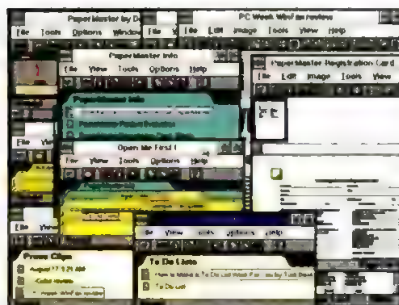


IS IT WORD or is it Watermark? OLE 2.0 means never having to Alt-Tab again. Note the table: That's an embedded Microsoft Excel object.



MULTISHEET INPUT capability on the PageOffice is a real time-saver.

...And Things We Didn't



YOU WANT CLUTTER? PaperMaster delivers. And this is only three cabinets, three folders, and two documents.



SCANPAQ'S "CALIBRATION SHEET" [sic] Need we say more?



EDGE GUIDES of negligible size (and little effectiveness) on the Plustek and other scanners.

The traditional view among scanner manufacturers—perhaps because most have roots in desktop publishing—was that hand-held scanners represented the practical, low-end, small-footprint alternative to flatbeds. Such scanners may have been appropriate for the occasional graphic image, but they were completely impractical for any volume of paper. Moreover, they were never bundled with any software tools for managing scanned documents.

CHANGE IS INEVITABLE

Over the past year or so, a new category of software and hardware has emerged that's having a deep effect on how people manage their paper documents. Most vendors and analysts attribute the birth of personal-level document and image management to Visioneer, which rolled out its affordable PaperMax scanner and MaxMate software nearly two years ago.

The PaperMax scanner looked a little like a long hero roll that sat behind your keyboard and plugged into your system's serial port (no need to open up your computer and configure adapter cards). As paper came across your desk that you wanted to store—press releases, business cards, letters, reports—you placed it at the lip of the scanner. The page fed through and immediately woke up the MaxMate software, which dropped the page into its repository. The scanner automatically fed paper through (albeit one page at a time), but it was capable of only black-and-white, 200-dpi scans. Still, it was almost exactly what most users wanted: easy storage and quick access to documents.

Although the Visioneer wasn't the first small-footprint, sheet-fed scanner, it was the first successfully positioned for the personal document/image-management market. Other vendors followed in Visioneer's footsteps, introducing or repositioning existing products, all striving for the same small footprint and ease of use.

In our personal-scanner section we cover eight units with price tags under \$500. Some, like Delrina Corp.'s WinFax Scanner, have chosen the same cardless approach (also convenient for use with a laptop) that Visioneer took, although

Scanner:

Pentax DS6

Software:

None

Bundle:

UMAX PageOffice

Users of personal document/image-management solutions want software with a powerful search engine and an intelligent storage metaphor, and hardware that lets them work quickly and efficiently.

UMAX Technologies' PageOffice is the one hardware/software prepackaged bundle that most closely fits this description. Visioneer's PaperPort should be far more competitive when it ships in a new version, due in the fall.

PageOffice combines UMAX's accurate 300-dpi scanner and intelligently designed PageManager software in a well-integrated product: All scanned documents instantly load into PageManager. The scanner handles text pages and 256-shade gray-scale images with equal aplomb. Once documents are inside, you can perform a number of functions on them, including filing, annotating, cropping, printing, faxing, and converting them to text via OCR.

PageManager's speed scores suffered on the OCR (full-text scan) version of our Import Scan test because the package uses an 8-bit scan mode for resolving brightness and contrast issues. But the 8-bit scan mode does ensure a highly accurate OCR process.

For users who'd like to build their ideal personal document/image-management solution, we tried to select the best personal scanner and the best software package. Among the scanners, Pentax Technologies' DS6 was unparalleled in features and performance. The DS6 has a resolution of 300 by 600 dpi (600 by 600 with interpolation), and its parallel-port connection is easy to install and use. It's also the only model that lets you bypass the PC if you want to make copies.

Although we found better applications than those bundled with the DS6 or PageOffice, we didn't find one that qualified as an Editors' Choice. Several,

though, deserve honorable mentions.

Most outstanding was Watermark Software's Watermark Enterprise Edition. Watermark's OLE 2.0 support makes managing live documents from disparate tools a snap. And it's eminently extensible, featuring routing, versioning, e-mail support, and networkability. Surprisingly absent are full-text indexing and Boolean search tools.

Compulink Management Center's LaserFiche Desktop Personal Edition has powerful indexing, searching, and batch-processing capabilities, and users can upgrade to Compulink's Desktop Network Edition. But because it lacks OLE support and has limited file import features, it can't match Watermark's application integration.

Caere Corp.'s PageKeeper impressed us with its superb OCR support. But PageKeeper's indexing paradigm can be slightly problematic, and some of the titles it creates can be vague.

If you want to go to the effort (and possibly greater expense) of building your own scanner/software combination, we recommend you start with the DS6 scanner and add one of our three honorable-mention products (depending on your needs). Add PageKeeper if you're looking for full-text indexing. If you already have another product that handles that task, try Watermark. It will integrate with almost any application. And for those who don't work with a lot of native-format electronic documents (word processing, spreadsheet files, and so on) but have reams of paper (faxes and scanned documents), LaserFiche should serve them well.





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they plug into the parallel port. Others require a SCSI or proprietary adapter card.

WHEN PAPER BECOMES BYTES

Like the hardware in this story, most of the software was built with the small business in mind. Some of the scanner vendors, such as UMAX Technologies, provide their own capable software solutions. Some software packages, such as Caere Corp.'s PageKeeper, were designed to serve the needs of the individual user. Still others, such as Watermark's Watermark Enterprise Edition, offer networking features (or upgrades to versions with networking features).

Personal document/image management software packages all have a common purpose, and the eight products we review in our software section are no exception. Typically, you scan or import documents into the package, run an OCR process, and store the documents in designated folders. You can usually mark each document with keywords or let the program index the text of the documents for easy searching.

All of the software products we reviewed offer a rich variety of approaches to managing paper. Some packages let you type in the details of a given document, and still others can read a document and assist you in filing it.

Information comes at us from all angles these days. We receive faxes and electronic mail and conduct on-line research. We also create our own documents that we want to manage. And once the files are stored, we might want to copy them, fax them, mail them, and (yes, more paper) print them. So it's not exactly surprising that these products are addictive: By pressing a few keystrokes, you can have any file you want at your fingertips.

Take another look at your overflowing in-box, and don't despair. Help is here today that'll turn that paper mountain into a molehill.

Our Contributors: ALFRED POOR is a contributing editor of *PC Magazine*. BEN Z. GOTTESMAN is a technical director for *PC Magazine*. DAVID A. HARVEY is a frequent contributor to *PC Magazine*. LANCE N. ULANOFF was the associate editor in charge of this story, and JEFF MACE was the project leader.

Personal Document/Image Management Software

Today's personal document/image management software makes document-centric processing a reality. By providing indexed and searchable storage structures, these products help you organize all of your electronic and paper-based data.

To qualify for this evaluation, products had to cost under \$500, include optical character recognition (OCR), offer full-text or keyword indexing, and have both search and document-storage facilities. They also had to include input support for electronic and paper documents.

The final cut left us with eight programs: GreenSoft Corp.'s GreenDesk for Windows, CompuLink Management Center's LaserFiche Desktop Personal Edition, Caere Corp.'s PageKeeper, UMAX Technologies' PageManager, DocuMagix's PaperMaster, Visioneer's PaperPort, Envisions Solutions Technology's Presto, and Watermark Software's Watermark Enterprise Edition.

You first scan paper documents or bring electronic documents into the software. There are three routes for the latter: importing and converting, linking, and external indexing. Importing puts the electronic file into the application, and linking simply creates a pointer to the file. External indexing provides full-text and keyword indexing of files without moving them. OLE 2.0 can enhance the latter process by letting you work with an object in its originating application.

MANAGING YOUR WORK

The best products support full-text and customizable keyword indexes that deliver fuzzy-logic, Boolean, and template-based

queries. OCR-based, full-text indexing is a powerful tool for managing reams of information. Good OCR will capture more than 90 percent of the words, and the fonts and page layout as well.

A fielded index can also be invaluable if, for example, you want a list of all documents in a certain subject category. Fuzzy logic is designed to look for words that match and are similar to your search terms. Boolean logic includes AND, OR, NOT, proximity, and range operators. Regular expressions use symbols such as <, >, |, -, and +.

Also look for annotation features. Such tools include highlighters, red-line markers, and text and freehand drawing tools. Some packages go halfway by letting you attach pop-up notes to a document.

Several features are designed specifically to save you time. Batch processing lets you run procedures such as indexing and OCR automatically and on multiple files. Integration with fax programs and support for MAPI and VIM e-mail are more ease-of-use extras. Some products even let you hook up to a network, and still others provide upgrades to network versions.

Finally, look for support for both Twain and the new ISIS (Image and Scanner Interface Standard) interface from PixTools/Scan Pixel Translations. ISIS offers better support for multiple pages and graphics than Twain.

Will your paper and document overload end when you start using one of the reviewed products? Not likely. But your organizational abilities should move up a notch, and the stacks of papers, loads of e-mail, and reams of faxes may soon seem less imposing, and even, well, manageable.

In a few simple steps, you can organize and store annoying piles of paper and loads of on-line files.

By David A. Harvey

You're about to plunge into client/server.

You've got a few butterflies, and plenty of questions.

Fortunately, thousands have done it before.

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The challenges of moving to client/server are well documented. But so are the secrets of success.

IBM has helped companies all over the world design multivendor client/server systems to help them gain a competitive advantage, adapt to change and get closer to their customers. And we're eager to share our knowledge.

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GreenDesk for Windows

ALL REVIEWS BY DAVID A. HARVEY

The ecology- and budget-friendly \$49 GreenDesk 1.3 comes packed in a recycled box that contains a manual printed on recycled stock. That there are three parts to the box is just the first of many incongruities.

This folder-based program strives to transcend document/image management and organize every data source imaginable. The folders are organized into a hierarchical structure that puts a "cabinet" at the top, followed by drawers that contain folders; the folders in turn hold documents. Folders and drawers, unfortunately, can't be nested. The cabinet window's top pane lists the current drawer and its folders, and the bottom pane shows a folder's documents.

MAKE IT YOUR DESK

You can organize GreenDesk's workspace as you like, tiling windows to view the cabinet as well as both a document's text and image. In addition to the ever-present toolbar, GreenDesk makes frequent use of a context-sensitive tool palette.

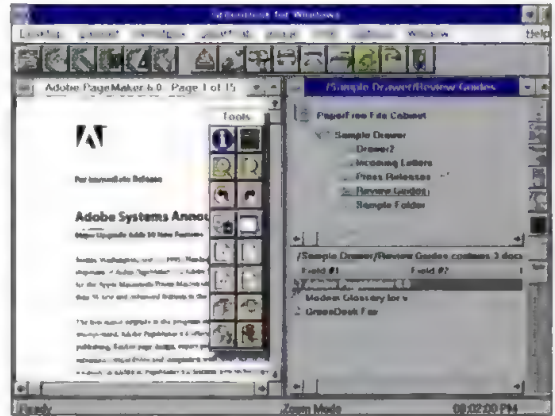
GreenDesk lacks support for OLE 2.0, which is surprising for a program that tries to integrate closely with all Windows data types. Right-mouse-button support is provided only in the image-view window. Also, the package lacks e-mail support and extensibility to networks.

The best way to pull in documents is through the in-box. Here, you can import documents from native file formats, fax programs (including Delrina Corp.'s WinFax), or the scanner. Documents are color-coded by source; the user can't change the color settings. You can sort documents on a variety of keys.

GreenDesk has a convoluted way of supporting file formats. Rather than pulling in a file's contents, GreenDesk makes use of Windows' file associations to create a pointer to a file. Click on one of these files and GreenDesk opens it in the appropriate application. Also, because of the open-endedness of this file-pointer arrangement, GreenDesk can provide links to many different kinds of file for-

mats, including .AVI and .WAV. True import only holds for graphics files (fax and image). Even text obtained by optical character recognition (OCR) is stored as a separate object.

You can scan documents individually or in batches; batch processing takes place in the in-box. Though its batch-processing



GreenDesk's cabinet lets you view, sort, and browse. You can't, however, see an image and its OCR'd text simultaneously.

abilities aren't as sophisticated as those of LaserFiche, GreenDesk does let you collocate all of your documents, index pages separately or as a group, and view and manipulate images.

PERSONAL DOCUMENT/IMAGE MANAGEMENT

Suitability to Task

Storage focuses on the document-storage capabilities of a product. We looked at how each product manages data archiving and auto-filing of incoming scanned documents, faxes, and other electronic files. Data management/compression also figures into a product's rating for this task.

Search looks at the robustness of each product's search engine, as well as the types of searches (full-text, keywords, Boolean), and the speed with which the program returns query results.

Our **OCR** task looks at the robustness and accuracy of each product's optical-character-recognition tool. This includes character accuracy as well as formatting and font recognition. Additionally, we look at how well the engine replicates our test document's page layout.

SUITABILITY TO TASK		
Product Name	Power	Ease
Storage	Poor	Poor
Search	Fair	Fair
Integration	Good	Good
OCR	Good	Good

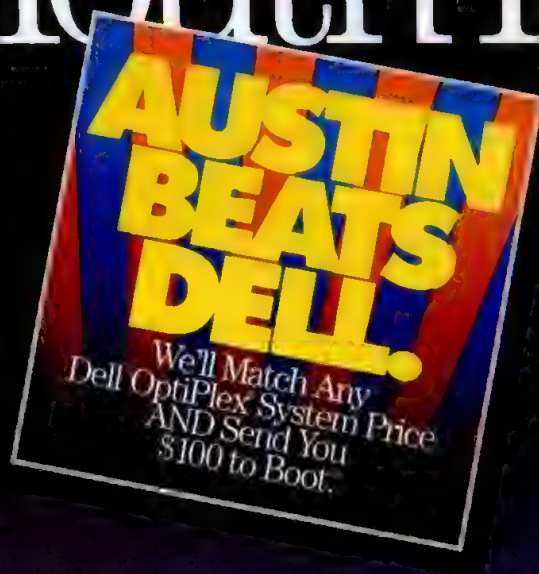
Application Integration addresses how well the products handle importing and exporting documents and files from other applications.

Suitability to Task for each personal document/image-management software product was rated in four categories: Storage, Search, Application Integration, and OCR (optical character recognition).

The **ease** ratings indicate the simplicity and intelligence of the interface design, as well as any tutorials, wizards, or other features designed to facilitate learning how to use the product. The ease ratings are also a product of how well an application automates the task of managing document and image files.

The **power** ratings address the depth of the document/image management tools. More specifically, they focus on the extent of file control and organization, of keyword and indexing features, and of integration with the rest of your applications.

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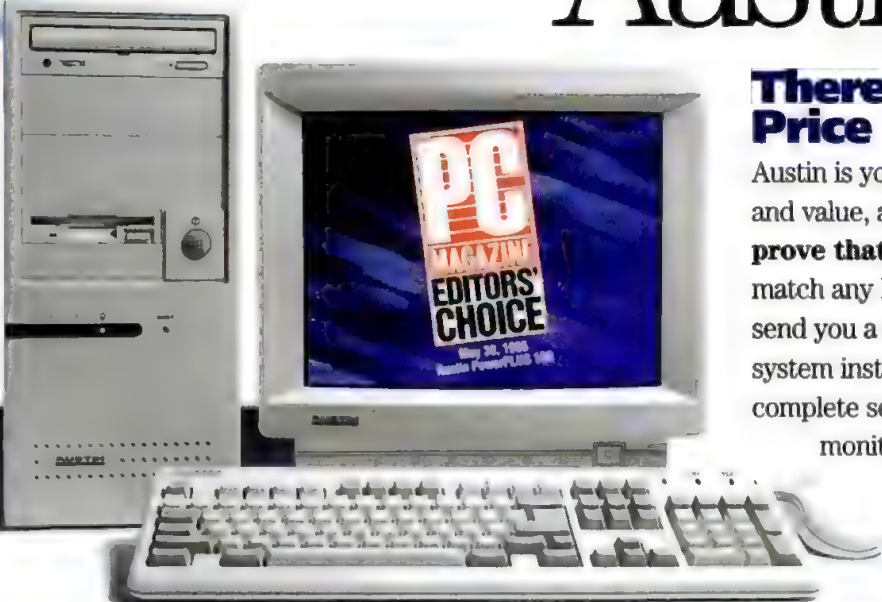
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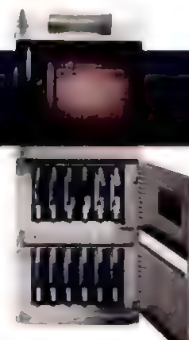
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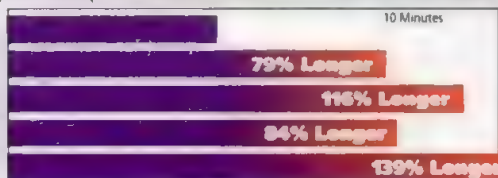
As the chart shows, you can waste a lot of time when you call the other PC companies with a question. Better have a good book to read!

Tech Support Average Response Time

Based on average of desktop and notebook scores.

Source: July 1995 PC Magazine

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Dell
Gateway
Micron
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* IPC Technologies, Inc. internal reporting indicates an average response time of under 2-minutes. Industry average is 8.7 minutes. Actual times may vary.

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CIRCLE 012 ON READER SERVICE CARD

Personal Document/Image Management

ORGANIZING PRINCIPLE

You use GreenDesk's SmartTabs for indexing. SmartTabs are easy-to-use, customizable index templates that let you set up multiple fields and are almost as flexible as those in LaserFiche.

It's unfortunate that GreenDesk doesn't support full-text indexing. You have to rely on keywords, so if you type in something vague or forgettable, you may have trouble finding your information when you need it.

When it comes to search and retrieval, GreenDesk stumbles again. The keyword search uses a word wheel built from the SmartTab keyword list. You won't find Boolean or fuzzy-logic support in keyword searches.

Searching from a SmartTab template is better. You can perform limited Boolean searches by specifying a logical AND or OR between, but not within, fields. You can also use regular expressions to narrow a field. Search results pop up alongside the SmartTab window. Double-click on a file and its SmartTab becomes active. It's the SmartTab that lets you move, copy, delete, and view your found files.

SUITABILITY TO TASK

GreenDesk for Windows

	Power	Ease
Storage	Fair	Fair
Search	Fair	Excellent
Integration	Fair	Fair
OCR	Fair	Good

GreenDesk's OCR is acceptable. In PC Magazine Labs' tests, GreenDesk handled well the pages we fed it, including the challenging table and magazine documents. The package uses the MacSoft Ocron OCR engine.

GreenDesk certainly has potential. The SmartTab feature makes creating indexes easy, and the centralized in-box metaphor could well be used to extend this program into Microsoft Windows 95's Exchange. Still, it falls short on such personal document/image management features as annotation—the only thing close is a memo feature in SmartTab—and full-text indexing. That leaves GreenDesk with plenty of room for improvement.

GreenDesk for Windows 1.3. List price: \$49. Requires: 4MB to 8MB RAM, 4MB to 5MB hard disk space, Microsoft Win-

dows 3.1 or later. GreenSoft Corp., Camarillo, CA; 800-588-3375, 805-388-1700; fax, 805-388-0660.

Circle 457 on reader service card

Compulink Management Center Inc.

LaserFiche Desktop Personal Edition

Compulink's \$195 LaserFiche Desktop Personal Edition 2.3 offers a rich assortment of text- and image-editing capabilities, placing it at the high end of the personal document/image management category. No other product in this roundup besides Watermark Software's Watermark Enterprise Edition has such sophisticated features. But the package, again like Watermark, suffers from some problems and omissions.

LaserFiche's folder-based interface features a button bar presiding over a customizable view. The view can contain the folder- and document-list window, as well as a document-display window.

Of particular merit is LaserFiche's document-view window, in which you can view text or images or both. Unlike other programs that send you into a separate image editor, LaserFiche lets you rotate the page and adjust brightness in the view window.

Noticeably absent, here and elsewhere in the program, are markup capabilities: You can't add graphical notes and can't annotate your images. Annotation support will be available in Version 3, due by the time you read this.

LaserFiche also suffers from some deficiencies in pulling in images, particularly when it comes to existing files. Import capabilities include text, .BMP, .PCX, and TIFF; there are no hooks to fax (you can only send faxes, not receive them). If you must pull in documents, LaserFiche will work with Mastersoft's Word for Word text editor to convert documents to text. The product also lacks any support for OLE.

STORAGE SAVVY

LaserFiche handles batch scanning adroitly, letting you worry about collating and sorting pages into documents after scanning is complete. It's here that Laser-

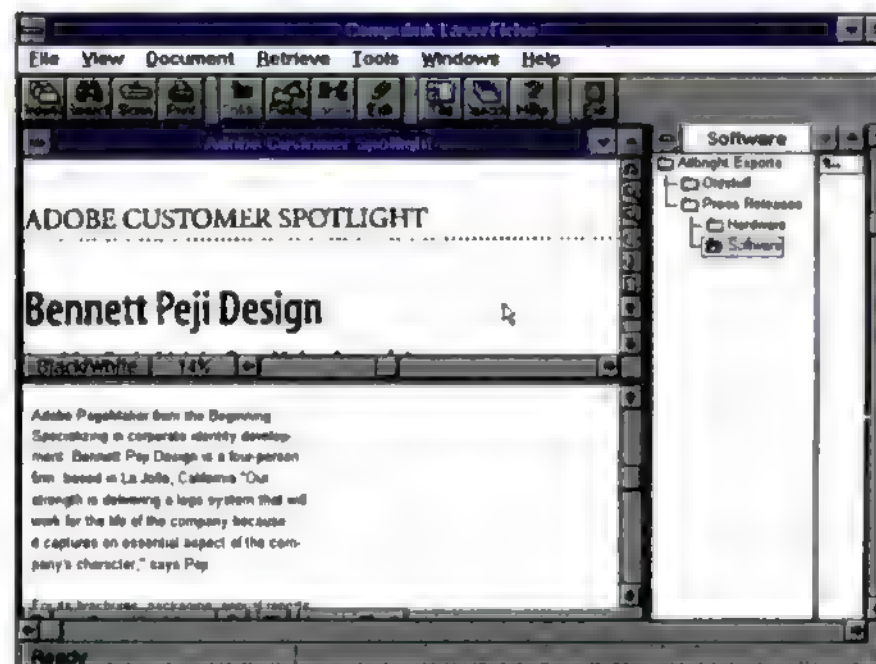
Fiche's management savvy really begins to show. The first thing you see on the screen after scanning a batch of documents is the Batch Window: On the left is the first of your newly scanned images and on the right is the index template, a batch-page listing, and a set of processing options.

You can start OCR processing or indexing from this screen, or you can choose to discard pages. Better yet, you can instruct LaserFiche to name the documents automatically in the batch using parameters that include date, time, and page count.

LaserFiche supports both keyword and full-text indexing. The keyword index is based on customizable templates that let you create fields that match different categories of documents. Fields can hold alphanumeric, numeric, and date strings.

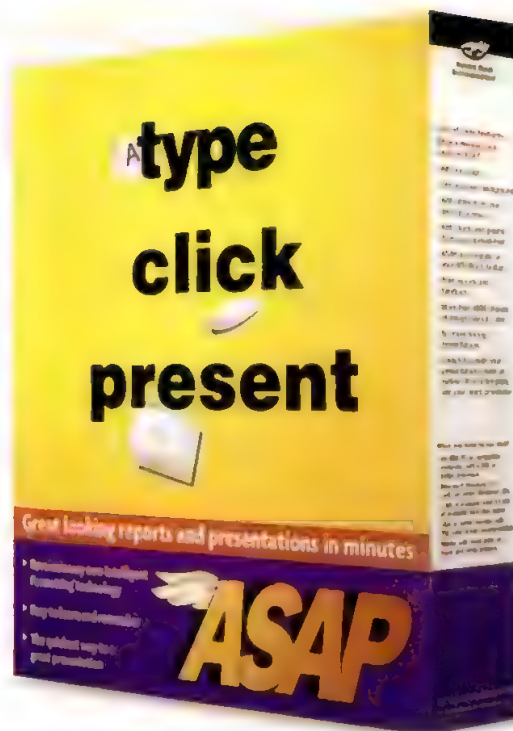
With the most sophisticated search engine of the products we reviewed here, LaserFiche lets you query the OCR text stream, the index fields, or both. Boolean searches are fully supported, as are regular expressions, including those that let you search for a range of numbers or dates. Fuzzy-logic support is user configurable, letting you adjust its tolerance to error. The Search Results window mutates to reflect the kind of search you choose to perform.

Searches display in a two-part window: The top shows the title and the number of hits in the document; the bottom lists details. For full-text indexing searches, the bottom windows lists each line in the document that contains occurrences of the search term. Hits are highlighted if you open the document.



LaserFiche's clean screen provides flexible browsing and viewing capabilities. One interface shows your document, the OCR'd text, and where the document is stored.

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Performance Tests: Personal Document/Image Management

What the Numbers Mean

On the OCR version of our Import Scan test, UMAX Technologies' PageManager was notably slower than its nearest competitor. On the Keyword version of the Import Scan test, Caere Corp.'s PageKeeper was by far the slowest. Otherwise, most of the times were acceptable, with faster results garnered by products optimized for speed.

PageManager's slow full-text scan can be attributed to its use of an 8-bit scan mode. It uses this mode for resolving brightness and contrast issues that are likely to affect the accuracy of OCR. As a result, PageManager posted some of the best OCR character-recognition results we saw (see "Performance Tests: Personal Scanners"). The next version of this package will let you opt for a 1-bit or an 8-bit scan.

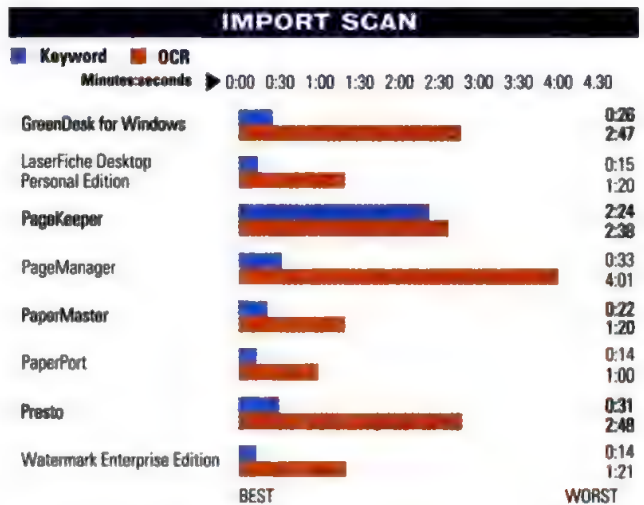
Visioneer's PaperPort for Windows had the best time in OCR full-text scanning because it scanned at a lower resolution: The PaperPort scanner supports only 200 dpi.

How We Tested

We performed our tests on a Dell Dimension 466 DM, a 486DX2/66-based PC with 8MB of RAM and a 340MB hard disk. We used the UMAX Personal Scan Device Scanner connected with a UMAX SCSI card to scan the images. For packages that did not support the Twain interface we used an Avison scanner. We also used the Avison scanner for Watermark Enterprise Edition, which we were unable to configure properly for the Umax scanner. Both the Avison and UMAX are 300-dpi scanners.

For our tests, PC Magazine Labs designed a 50-document database com-

posed of 157 individual pages. The documents were a mix of press releases and magazine articles ranging from 1 to 13 pages. For the **Keyword** version of our **Import Scan** test we measured the amount of time it took to scan our test document and for it to appear on the screen, and then added the time it took to add the image and keywords to our database. We did not include the time it took to type in user-defined keywords (if this feature was supported by the application). For the **OCR** version of our **Import Scan** test we measured the total time it took to scan in our document and to do a full-text OCR. This was usually one continuous, automatic process. The test did not include indexing.



A missing feature in an otherwise excellent search facility is the ability to perform permanent operations on documents. You can make virtual copies and drag to folders, but you cannot move items.

SUITABILITY TO TASK

LaserFiche Desktop Personal Edition

	Power	Ease
Storage	Good	Excellent
Search	Excellent	Excellent
Integration	Poor	Fair
OCR	Good	Good

OCR, although not up to Caere Corp.'s PageKeeper standards, is quite good, recognizing complex magazine pages with shaded backgrounds and tables accurately. LaserFiche is set up to deal with 6- to 24-point text, and you can OCR selected pages, but not parts of pages, of a document.

For \$300, users can upgrade to LaserFiche Desktop Network Edition to hook into e-mail and link up with a network. LaserFiche Desktop Personal Edition does have some limitations, but it offers exceptional file-management and searching and indexing features, and its upgrade path

makes it an especially noteworthy value.

LaserFiche Desktop Personal Edition 2.3. List price: \$195. Requires: 8MB RAM, 10MB hard disk space (12MB recommended), Microsoft Windows 3.1 or later. Compulink Management Center Inc., Torrance, CA; 310-212-5465; fax, 310-212-5064. Circle 458 on reader service card

Caere Corp.

PageKeeper

Caere Corp.'s \$195 PageKeeper 2.0 is one of the more intelligently designed applications in this evaluation. It does, however, feature a rather sluggish keyword-import routine and an idiosyncratic indexing paradigm.

Everything about PageKeeper looks inviting. The interface makes working with documents a snap. In the default view, the folder window is displayed to the left and the document (image or text view) to the right. On top, a button bar affords quick access to PageKeeper's features.

PageKeeper organizes documents into a nested folder structure that lets you easily drag-and-drop between folders. How-

ever, the product lacks right-mouse button support and doesn't let you drop documents onto the button bar, and it doesn't support OLE.

Getting your information into PageKeeper is a breeze. You can import practically any word-processor or graphics file format—including fax files. The program has built-in hooks to MAPI and VIM e-mail systems, as well as close integration with Delrina Corp.'s WinFax Pro. Better yet, PageKeeper, like Watermark Enterprise Edition, lets you index and search for external files—so you don't have to import documents into PageKeeper to organize them. The next version of PageKeeper is slated to have networking capability.

It's when you begin to delve into the deeper functions of the program that you encounter a host of frustrating idiosyn-

SUITABILITY TO TASK

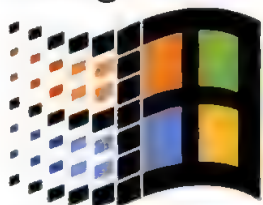
PageKeeper

	Power	Ease
Storage	Good	Fair
Search	Good	Fair
Integration	Good	Excellent
OCR	Excellent	Excellent



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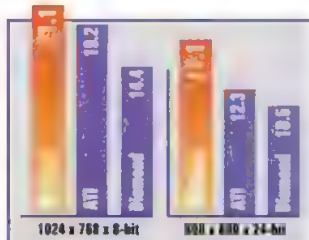
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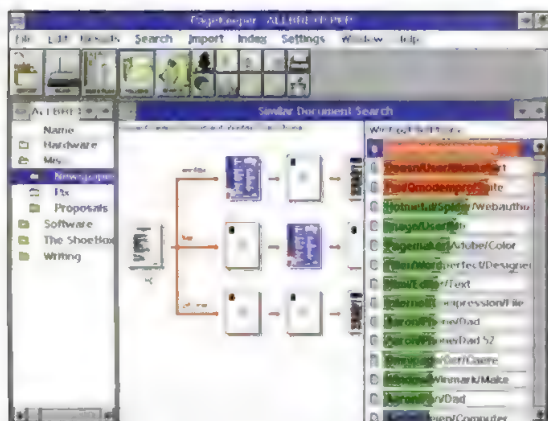
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*Estimated street/estimated selling price for the 2 MB version.
Winbond 95 Series Build 5011 conducted by Matrox Graphics Inc. using
2M Dows Winbench 95 on a Gateway P100 system with 256K cache,
16MB RAM at 1024 x 768 in 256 colors (single forest) and 600 x 600 in
16.7 million colors (small forest) 72 Hz. The Matrox MGA Millennium,
Diamond Stealth 64 and ATI Graphics Pro Turbo were configured with
2 MB of memory for the PCI bus using driver releases 2.00.001,
4.00.501 and 4.00.501 respectively.



matrox



PageKeeper's main screen is well laid out with an excellent button bar. Similar Document Search is a great tool—if the title words are accurate.

crasies. Batch-processing and indexing functions top that list.

Unlike every other program we saw in this evaluation, PageKeeper doesn't have true batch processing. Instead of automatically processing multiple documents

by letting you collate and rearrange pages after they've been scanned, PageKeeper asks that you manually insert a blank sheet to separate each document. What's more, if you're scanning in two-sided documents, you have to scan a blank page between each side.

Rather than traditional indexing, in which you enter keywords into a template, PageKeeper uses the results of its OCR process to generate a three-word title for each document. You can change the title, but the new title won't become part of the index.

For the most part the generated titles made sense. PageKeeper labeled a WinFax press release as "Winfax/file/phone." Sometimes, however, PageKeeper shoots rather wide of the mark and you're left with nonsense in your document list. Im-

porting the testing script for this story left us with the incomprehensible title "Doesn/User/Bkmkstart."

The product does offer searchable, full-text indexing. All note text is fully indexed as well (you can attach a note to a document after it's been imported). There's no automatic date stamping.

There are no fields in PageKeeper's indexing function. Instead, when the package runs a search, it looks in the OCR stream, document notes, or both. Boolean, similar-document, and word searches are supported.

PageKeeper's Boolean search facility is limited to AND and OR operators; no NOT and no proximity searches here. The Natural Language word search is smart enough, though, to find all words with the same root. The similar-document search uses the three-word title automatically assigned by the software to build a tree, one branch for each word in the title. Search results are ranked and color-

Alphabet Scoop: FileABC

FileABC from File ABC, a Nevada Limited Partnership (808-523-7857), didn't make our comparative evaluation because of its lack of OCR support. We took a look at a prerelease version of Version 5.0, which should be shipping by the time you read this. The package costs \$99.95, plus shipping and handling.

FileABC delivers the basics: image import, storage, retrieval, and archiving.

What it doesn't include is support for annotation, e-mail, or OLE. OCR support is provided peripherally: FileABC provides links to the OCR engine of your choice.

FileABC's main screen consists of a series of folder tabs. Each folder is a database; you can have unlimited number of folders, and each folder has its own indexing scheme. You can customize your file-organization arrangement easily.

Three document views are at your disposal: thumbnail, page, and a Document List, which is a database table. You can have multiple documents in the same

category. To visually search for a document, you look at the database table, click on the document's entry, and finally click on the icon for thumbnail or page view.

You can scan from Twain-compliant, but not ISIS-compliant, scanners. FileABC also supports hardware based on the Kofax PC-compression specification.

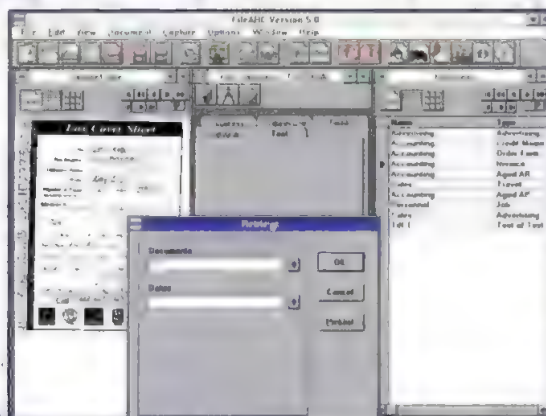
File import is limited to .DCX, .PCX, and TIFF. A well-implemented TIFF-import feature lets you import into single or multiple documents and opt to use the TIFF header information (such as file name or number of pages) to build an index entry.

Like DocuMagix's PaperMaster, FileABC can serve as a Windows printer driver, letting you turn any

application's output into raster images that FileABC can store.

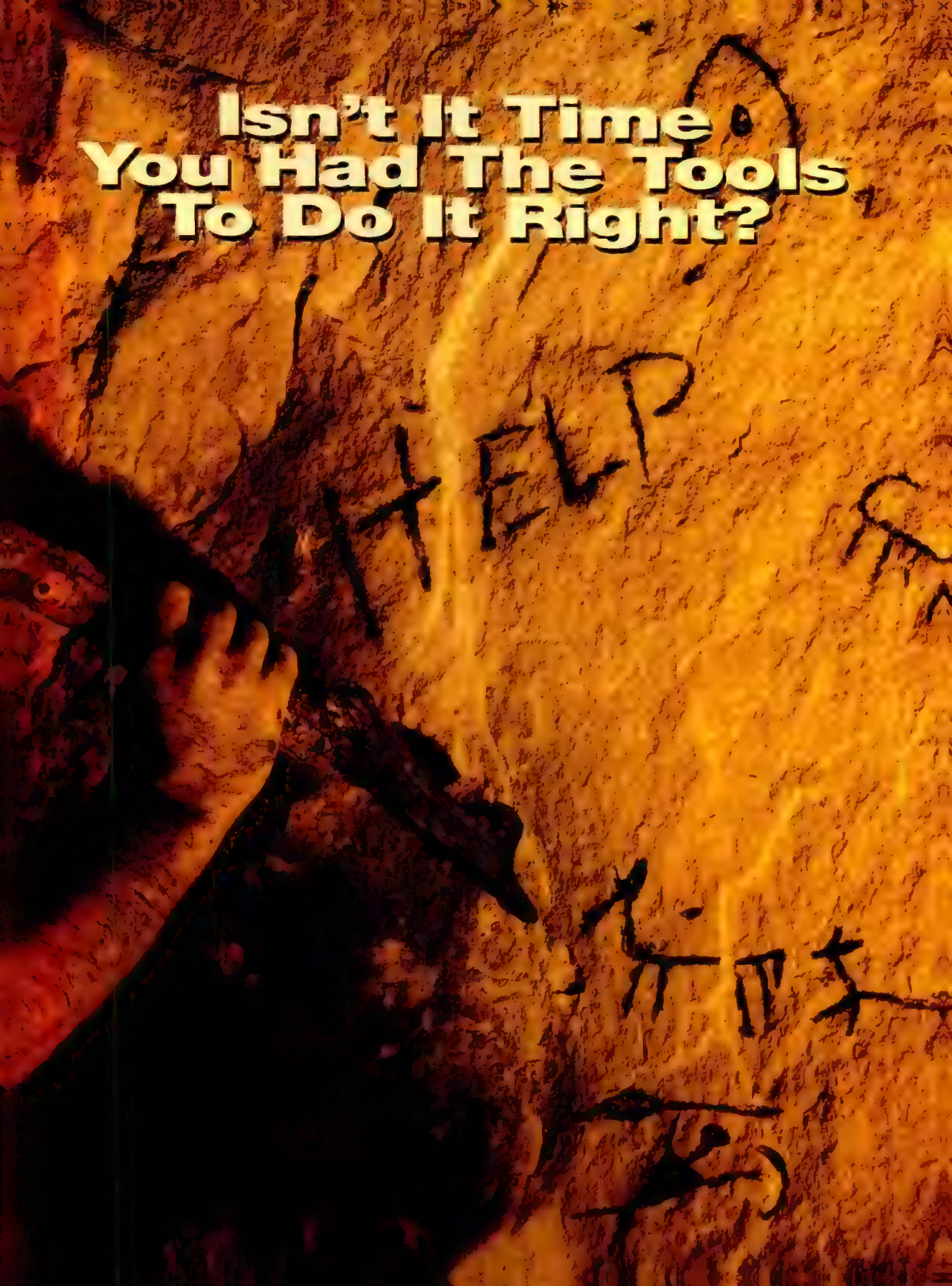
FileABC features minimal indexing functions. Records are stored in a Microsoft Access database. You can enter document properties either in the table view or on a separate indexing screen. Indexes are set up when you create a cabinet and are specific to each cabinet.

FileABC has fairly good support for archiving. You can store documents on any device as long as it has a recognizable DOS volume drive letter. Documents can be sent to storage based on searches, storage space, and age.—DAH



FileABC brings Microsoft Access to the paper chase. In another interface twist, each folder is a cabinet; the documents are listed in the database record.

**Isn't It Time
You Had The Tools
To Do It Right?**





coded by relevance. This weighted listing is useful and accurate. The similar-document search adds a tree that shows thumbnails of document trails proceeding from each of the title words.

CAERE-FUL READER

Using Caere's acclaimed OCR engine, PageKeeper turns in the best all-around OCR performance in this roundup. For starters, part of Caere's technology lets PageKeeper match fonts, delivering an electronic page whose layout comes close to matching that of the original paper document. Our tests verified the accuracy of PageKeeper in dealing with both tables and multiple columns.

You can choose to import images without OCR processing, but if you do so, you can't go back and perform OCR on the image later. You can, though, elect to do a faster keyword import that does not involve OCR; you'll be prompted to name every document and assign keywords. Every document must be indexed.

In indexing and batch processing, PageKeeper leaves a bit to be desired. But the package is well suited for those who want strong file-management features and OCR support.

PageKeeper 2.0. List price: \$195. Requires: 8MB RAM, 15MB hard disk space, Microsoft Windows 3.1 or later. Caere Corp., Los Gatos, CA; 800-535-7226, 408-395-7000; fax, 408-354-2743.

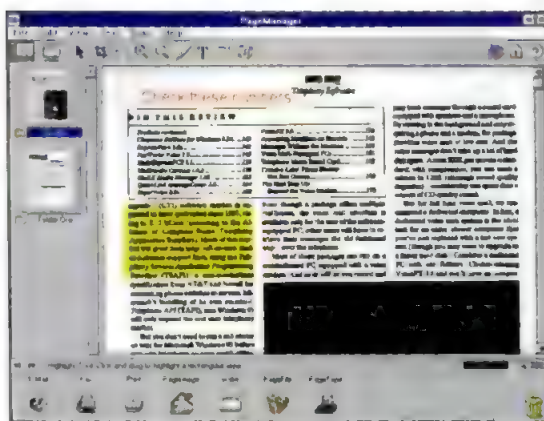
Circle 459 on reader service card

UMAX Technologies Inc.

PageManager

UMAX's PageManager 1.01 blends forms processing, image editing, scanning, and storage functionality into a \$399 bundle called PageOffice that includes the company's SCSI Personal Scanning Device. The result is a multifaceted package well suited for users who manage relatively small amounts of paper.

Open the application and you're staring at a screen that's quite similar to that of Visioneer's PaperPort, the other software-and-hardware bundle in this feature. The difference is that this application is for scanning and processing only. A single folder sits on the left, thumbnails of documents on the right. Folders are displayed both as a folder icon and as a pile



PageManager's well-connected desktop delivers basic annotation features along with drag-and-drop links to other applications.

of thumbnails above the icon. Up top, you'll find a button bar and down below, buttons that link to other applications.

From PageManager (the main software interface), you can launch one of three programs. There's PageType, a forms editor; PageImage, an image editor; and PageFile, a personal document-imaging system. These three modules free up PageManager to act as a point of entry for scanned documents.

When it comes to dealing with documents, PageManager is extremely flexible. You can set up to scan to the desktop, directly to fax, or to any other button-bar application; you can also drag pages to the button bar. Annotation features include a highlighter and a text tool, and more advanced annotation functions exist as part of PageType. Also, PageManager provides support for MAPI and VIM mail, and has built-in send-fax capabilities.

As with Visioneer's PaperPort, PageManager can hang out in the background until you put paper in the scanner. But the UMAX package also lets you activate scanning (and PageManager) via a set of buttons on the scanner.

As for routes of entry for electronic documents, you deal with the PageFile application, which doesn't really import but rather creates a copy of a file and produces a thumbnail of the document. The next version of PageOffice, due in the first part of 1996, will let you import electronic documents into PageManager itself.

PageType, the forms processor, offers some useful capabilities: If you scan in a blank form, PageType will recognize the

spaces, let you enter responses electronically, and then print to the original form with all the responses in the right spaces.

The problem with these modules is that they're not well integrated. Seamless integration is planned for the next version of the package.

The package supports full-text and keyword indexing. There are index fields for keyword and title; you can run limited Boolean searches (using AND and OR operators) on index fields and exact-match searches on document titles.

OCR performance is above average. The bulleted lists, columns, and simple text were recognized almost perfectly, although the engine did have some problems with text on shaded background. The engine is made by MacSoft Ocron.

PageManager was the slowest performer on the OCR (full-text scan) version of our Import Scan test, taking more than a full minute longer than the nearest competitor. That's because PageManager defaults to an 8-bit scan mode for resolving brightness and contrast issues. That in turn provides the high level of accuracy in PageMaster's OCR processing. The next version of the UMAX product will support both 1-bit and 8-bit scans.

SUITABILITY TO TASK

	PageManager	
	Power	Ease
Storage	Good	Good
Search	Good	Fair
Integration	Good	Good
OCR	Excellent	Good

For a bundle, you get a lot with PageOffice. Although PaperPort's interface is better than PageManager, PaperPort doesn't have the bundled filing capabilities of PageManager. If you don't plan on dealing with huge quantities of documents, PageManager will fill your needs admirably.

PageManager 1.01. List price: PageOffice scanner bundle, including PageManager, \$399. Requires: 4MB RAM, 20MB hard disk space, Microsoft Windows 3.1 or later. UMAX Technologies Inc., Fremont, CA; 800-562-0311, 510-651-4000; fax, 510-651-8834.

Circle 460 on reader service card

SUMMARY OF FEATURES

Document/Image Management Software

Continues

■ YES ■ NO Products listed in alphabetical order	GreenSoft GreenDesk for Windows 1.3	CompuLink- Management Center Inc. LaserFiche Desk- top Personal Edition 2.3	Caere Corp. Page- Keeper 2.0	Technologies Inc. UMAX Page- Manager 1.0	DocuMagix Inc. Paper- Master 1.1	Visioneer PaperPort	Envisions Solutions Technology Inc. Presto! 1.3	Watermark Software Inc. Watermark Enterprise Edition 2.01
Price	\$49 (list)	\$195 (list, non- network); \$495 (list, network)	\$195 (list)	\$399 (list)	\$169 (list)	\$369 (street)	\$149 (list)	\$295 (list)
Operating-System Support								
Microsoft Windows 3.1	■	■	■	■	■	■	■	■
Microsoft Windows 95 (native/compatible)	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Microsoft Windows NT 3.51	■	■	■	■	■	■	■	■
OS/2 Warp Connect	■	■	■	■	■	■	■	■
DOS	■	■	■	■	■	■	■	■
Database								
Search engine	■	■	■	■	■	■	■	■
Performs Boolean searches	■	■	■	■	■	■	■	■
Performs fuzzy searches	■	■	■	■	■	■	■	■
Full-text search engine	■	■	■	■	■	■	■	■
Spell-checker	■	■	■	■	■	■	■	■
Indexing/Sorting								
Indexing by:								
Author	■	■	■	■	■	■	■	■
Category	■	■	■	■	■	■	■	■
Creation date	■	■	■	■	■	■	■	■
Keywords	■	■	■	■	■	■	■	■
User-defined category	■	■	■	■	■	■	■	■
Users can create their own profiles for indexing and keywording	■	■	■	■	■	■	■	■
Sorting by:								
Any field	■	■	■	■	■	■	■	■
Primary and secondary fields	■	■	■	■	■	■	■	■
Multiple fields	■	■	■	■	■	■	■	■
Batch-document indexing	■	■	■	■	■	■	■	■
Document/Image Management								
Built-in scanning ability	■	■	■	■	■	■	■	■
ISIS support	■	■	■	■	■	■	■	■
Twain support	■	■	■	■	■	■	■	■
Folders	■	■	■	■	■	■	■	■
File import:								
.WMF files	■	■	■	■	■	■	■	■
Microsoft Word for Windows version	1.x or higher	N/A	1.x or higher	N/A	N/A	N/A	Version 6.0	N/A
WordPerfect	■	■	■	■	■	■	■	■
Fax bitmaps:								
TIFF	■	■	■	■	■	■	■	■
CCITT TIFF	■	■	■	■	■	■	■	■
Group 4 TIFF	■	■	■	■	■	■	■	■
WinFax native file format	■	■	■	■	■	■	■	■
Can serve as a printer driver to capture document images	■	■	■	■	■	■	■	■
Image compression	■	■	■	■	■	■	■	■
Document annotation as a file attachment	■	■	■	■	■	■	■	■
Image-View Options								
User can view original documents	■	■	■	■	■	■	■	■
Thumbnail document views	■	■	■ *	■	■	■	■	■
Zoom	■ (1-800%)	■ (1-1,000%)	■ (25-200%)	■ (25-100%)	■ (25-200%)	■ (25-200%)	■ (25-100%)	■ (1-200%)
User can perform OCR on every document automatically	■	■	■	■	■	■	■	■
OCR for indexing	■	■	■	■	■	■	■	■

N/A—Not applicable: The product does not have this feature.

* Thumbnail document views are available only when the user is running a similar-document search.

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SUMMARY OF FEATURES

Document/Image Management Software

Ends

■ YES ■ NO	GreenDesk for Windows 1.3	LaserFiche Desktop Personal Edition 2.3	Page-Keeper 2.0	Page-Manager 1.0	Paper-Master 1.1	PaperPort	Prestol 1.3	Watermark Enterprise Edition 2.01
Products listed in alphabetical order								
Batch-document OCR processing	■	■	■	■	■	■	■	■
Graphics recognized and saved with document during OCR	■	■	■	■	■	■	■	■
Graphics stored separately	■	■	■	■	■	■	■	■
User-definable recognition zones	■	■	■	■	■	■	■	■
Can recognize columnar text/text flow on a single page	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Text flows across multiple pages	■	■	■	■	■	■	■	■
Can recognize tabular text	■	■	■	■	■	■	■	■
Document Export								
File types:								
Microsoft Word for Windows	■	■	■	■	■	■	■	■
WordPerfect	■	■	■	■	■	■	■	■
ASCII	■	■	■	■	■	■	■	■
RTF	■	■	■	■	■	■	■	■
Tab-delimited	■	■	■	■	■	■	■	■
Drawing Tools								
Bezier curves	■	■	■	■	■	■	■	■
Ellipses	■	■	■	■	■	■	■	■
Freehand lines	■	■	■	■	■	■	■	■
Lines	■	■	■	■	■	■	■	■
Rectangles	■	■	■	■	■	■	■	■
Places annotation fields directly on image	■	■	■	■	■	■	■	■
Mail Support								
Sends/receives mail	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
VIM	■	■	■	■	■	■	■	■
MAPI	■	■	■	■	■	■	■	■
OLE								
Version 1.0/Version 2.0	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Server/Container	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Network Support								
LAN	■	■	■	■	■	■	■	■
Peer-to-peer networking	■	■	■	■	■	■	■	■
Document sharing	■	■	■	■	■	■	■	■
Document routing	■	■	■	■	■	■	■	■
User database can be stored on a network volume	■	■	■	■	■	■	■	■
Security								
User-definable database password	■	■	■	■	■	■	■	■
Encrypts documents	■	■	■	■	■	■	■	■

DocuMagix Inc.

PaperMaster

There's always a maverick, and that's not always a good thing. DocuMagix's PaperMaster 1.1 (list price \$169) is a perplexing program, as it organizes information in a convoluted manner.

Like the rest of the packages in this feature, PaperMaster uses a folder metaphor. But with PaperMaster, instead of a tree-and-document view, you get a stack of file-cabinet-drawer icons.

Pop open a cabinet and you're in for a

surprise. DocuMagix has taken the file-cabinet metaphor literally: Color-coded folders are arranged as you'd see them in a file drawer. Click on a tab, and a parent-level window opens with a sortable list of documents.

Seems fine, until you need the hierarchical organization provided by a folder tree. You can add an unlimited number of documents and folders, but once you start rooting around for documents, the screen will quickly become littered with windows. Another problem is that nesting is limited: Drawers contain folders that in turn con-

tain documents—period.

The file-view window, however, takes a firm stance on the high ground. A parade of thumbnail images runs above a full-size view of a single page. Here, you can perform rudimentary image cleanup, drag-and-drop pages to rearrange them, import additional pages, change the title, or refile the document in the in-box or in a folder.

The button bars and menus are consistent across all of PaperMaster's windows. You can search, import, and view from any menu, anywhere in the program. PaperMaster supports 255-character file-

Personal Document/Image Management

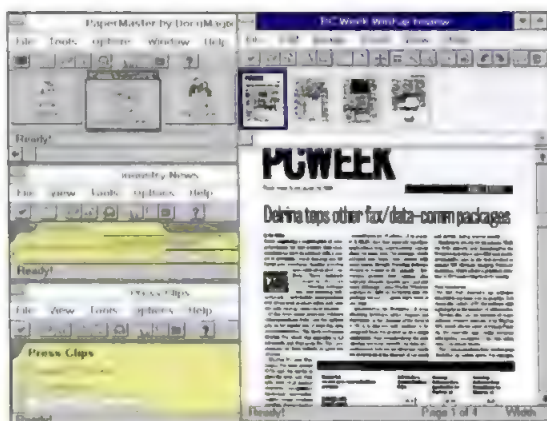
names, and although there are no highlighting or red-lining features, you can add any number of notes to documents.

MORE TROUBLE

When it comes to getting information in, PaperMaster can be problematic. For starters, file import is restricted to .PCX and TIFF. If you want to get information out of Microsoft Word or any other program, you have to use the PaperMaster printer driver to "print" a TIFF file that lands in the in-box, and then perform OCR on the "printed" document. (There's a shortcut: You can use macros, which appear as toolbar buttons in your applications, to print to PaperMaster. But you're still only printing the image of the file.)

Scanning is a simple, bare-bones process. You can use the Twain or ISIS controls to set contrast, brightness, and paper size. The package also lets you run batch processes for OCR.

Once the document's in, you find yourself in the image-view screen with a filing-



PaperMaster has a unique perspective when it comes to the cabinet-drawer-and-folder metaphor. The viewer lets you view thumbnails and full-page images.

port and offers no network connectivity. Version 2.0, slated for release around the beginning of November, will let users create and share file cabinets and data on local and networked drives.

While it does have several decent image-editing and ease-of-use features, PaperMaster's usefulness suffers from an insufficiently organized interface and poor search facilities.

PaperMaster 1.1. List price: \$169. Requires: 8MB RAM, 7MB hard disk space, Microsoft Windows 3.1 or later. DocuMagix Inc., San Jose, CA; 800-362-8624, 408-434-1138; fax, 408-434-0915.

Circle 461 on reader service card

Visioneer Inc.

PaperPort for Windows

PaperPort for Windows is a slick product that comes in a bundle (street price \$369) with Visioneer's scanner. It will not, however, connect to any other scanners.

Like Watermark Enterprise, PaperPort supports annotation and e-mail. Also like Watermark, PaperPort's user interface is clean, intuitive, and exceptionally easy to use. But the similarities stop there.

Based on a folder metaphor, PaperPort's main screen displays a tree-and-documents view. On the left, the folders; on the right, thumbnails of all documents within a folder. Folders are not nestable: the filing system is completely flat. Folder-content lists are displayed as thumbnails. Those contents are restricted to images; PaperPort doesn't handle text objects.

SUITABILITY TO TASK		
PaperMaster		
	Power	Ease
Storage	Fair	Fair
Search	Fair	Poor
Integration	Fair	Fair
OCR	Fair	Fair

options bar displayed above the thumbnails. One option, the AutoFiling feature, tries to put your documents into folders automatically based on an analysis of what the document looks like. It's great in theory, but in practice we found that similar documents with different types of content all ended up in the same place.

You assign the title and any textual annotations, and PaperMaster chimes in with the system date and time and your name, the only key fields supported. The only way to find information in PaperMaster is by using Boolean operators to run a word search, based on the indexed OCR text, that's capable of finding parts of words. Also, you can't view or edit OCR text, a fact that thwarted our attempts to verify PaperMaster's OCR acuity.

The package lacks MAPI or VIM sup-

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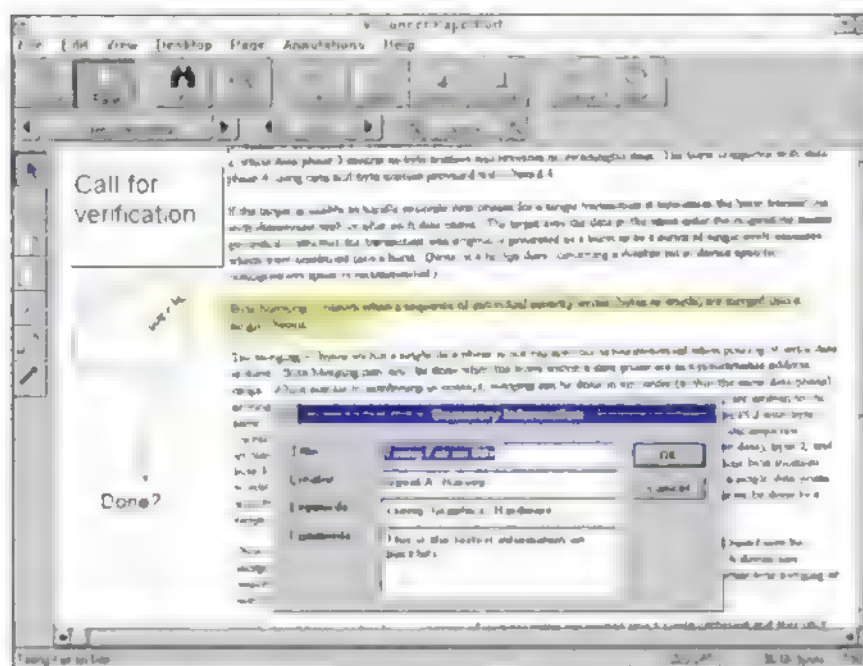
Along the top of the interface is the ever-present button bar, and along the bottom is a button bar that links PaperPort files to other applications. Drag a thumbnail onto the Microsoft Word icon, and the Caere WordScan engine recognizes the text and opens the text in Word. Similarly, you can drag-and-drop to mail, fax, printer, and other user-defined icons. Here, you can also perform most basic page-manipulation functions, as well as "stack" and "unstack" groups of pages.

The main screen is modal. Click on a thumbnail and it transmutes to a close-up of your document with an annotation toolbar along the side.

GETTING STARTED

Getting paper into PaperPort is as easy as sticking a sheet into the Visioneer scanner. The software automatically pulls the document onto the PaperPort desktop. Setting scanning controls is just as easy: You adjust for brightness, contrast, paper size, and the rest in the Preferences dialog box. Because the Visioneer is a page-at-a-time scanner and because PaperPort can arrange thumbnails quickly and efficiently, the batch-processing issue is a moot one. You can combine any pages into PaperPort's stacks.

File import is limited to .BMP, .DCX, .PCX, TIFF, and PaperPort's proprietary .MAX format. Like PaperMaster, PaperPort installs a printer driver for rasterizing



PaperPort's image-viewing screen gives you decent tools for document processing. Limited document summaries mean you have to be careful with keywords.

search facility. Nothing fancy here—no Boolean operators or regular expressions. But what you can do is search by Title, Creator, Keywords, Comments, and Annotation fields. The search form lets you toggle case sensitivity and whole-word search, and can try to match any (a de facto OR) or all (AND) fields.

CLEAR VISION

The Caere OCR engine fared extremely well in our tests; it dealt with all the pages we handed it and allowed columnar and noncolumnar output.

For \$49, you can purchase an upgrade to PaperPort that provides e-mail links. A new version of PaperPort, which will be available in the fall, will have built-in e-mail support and will increase the number of links to software applications to more than 100. Other changes to the software, according to a company representative, will include ease-of-use features as well as enhancements that will make documents more readable for the purposes of faxing, filing, copying, and editing.

The next version of the PaperPort bundle will also include a redesigned scanner. The company expects to ship the new version shortly.

For scanning a few pages at a time, this version of PaperPort will serve admirably. But if your needs extend to detailed indexes, on-line text, or searchable OCR streams, its usefulness is quickly outlived.

PaperPort for Windows. *Estimated street price: with PaperPort scanner, \$369. Requires: 8MB RAM (4MB without OCR),*

8MB hard disk space, serial port, Microsoft Windows 3.1 or later. Visioneer Inc., Palo Alto, CA; 800-787-7007, 415-812-6400; fax, 415-855-9750 (sales), 415-493-0399 (technical support).

Circle 462 on reader service card

Envisions Solutions Technology Inc.

Presto

It's a little surprising when you buy a software package and the entire thing fits inside the disk mailer it was shipped in: You have to wonder what you're getting. Such is the case with Presto 1.3, from Envisions Solutions Technology. Inside the mailer you'll find a \$149 product that features an easy-to-use interface and basic searching and indexing abilities. Unfortunately, you'll also find a handful of shortcomings.

Presto's storage metaphor is a file room with up to two file cabinets, each with two drawers that each houses up to

SUITABILITY TO TASK

Presto

	Power	Ease
Storage	Fair	Fair
Search	Fair	Fair
Integration	Fair	Fair
OCR	Fair	Fair

five unnestable folders. The main screen is very well organized. Below the button bar, on the left, is the filing system. On the right is a window that displays thumbnails. There's an application-launching bar on the right of the screen. You click on either the tree or the thumbnail display to navigate and open documents.

Presto's documents are de facto folders: You can import multiple files into a document and drag-and-drop pages between documents. You can put up to 250 files into a folder.

Three tool palettes give drag-and-drop access to Presto's modules, including Presto Filer, Presto Scan, and Presto Edit, a basic image editor. Because Envisions licenses some technology from UMAX, some features in the Presto modules closely resemble those of UMAX's Page-Manager.

NOT QUITE MAGIC

Presto shares an unfortunate commonality with most of the other document man-

SUITABILITY TO TASK

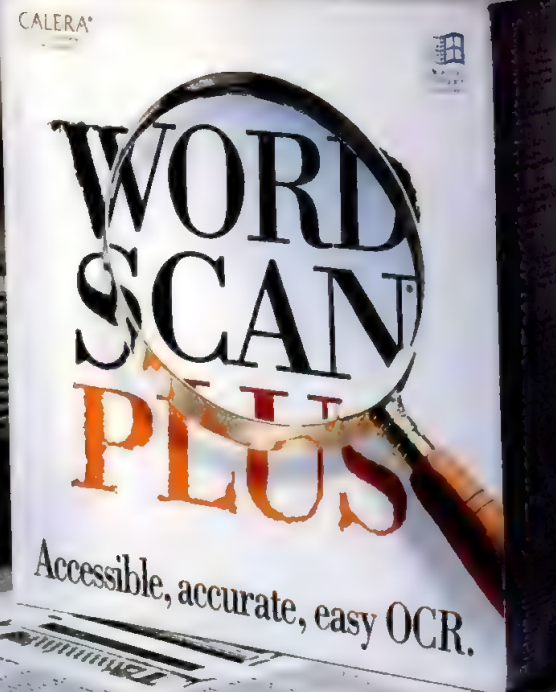
PaperPort for Windows

	Power	Ease
Storage	Fair	Excellent
Search	Fair	Fair
Integration	Good	Good
OCR	Fair	Good

or "printing" documents into PaperPort.

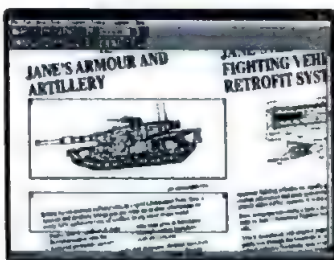
There are three levels to PaperPort's indexes: document title, a document-summary field, and annotation text. There's no date, no user-definable index fields, and no full-text indexing. The Document Summary screen lets you enter Title, Creator, Keywords, and Comments. You can search visually (via a tree-and-folder explorer window) or through PaperPort's

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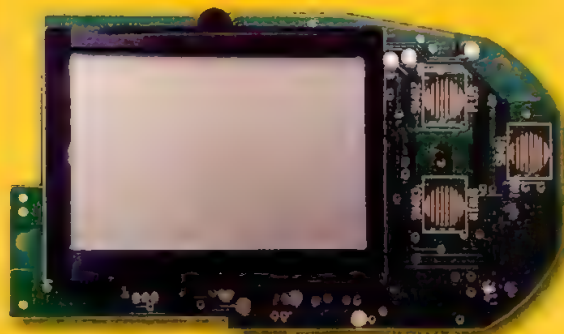
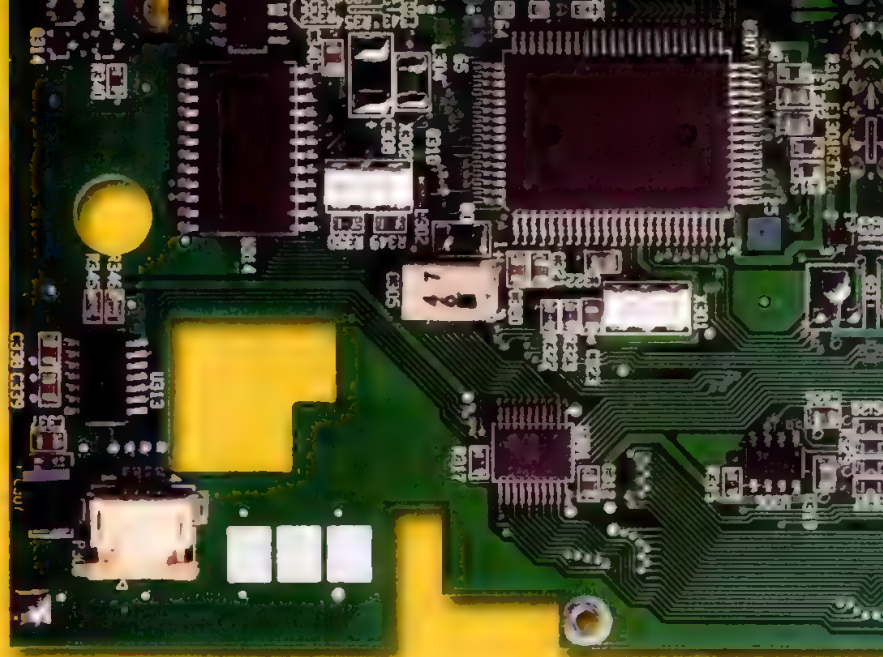
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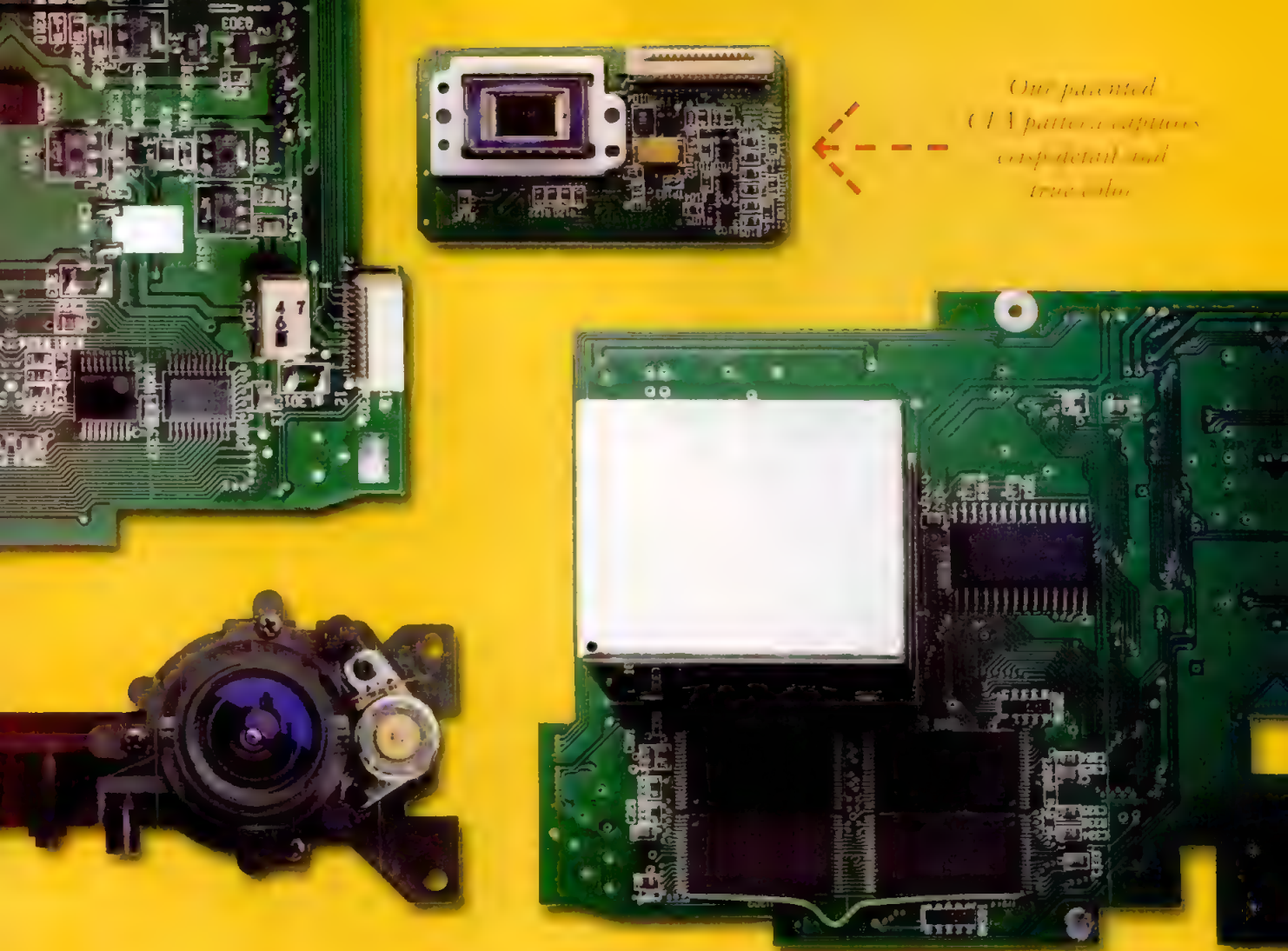
The beauty
of the *Kodak Digital Science™* DC40 camera's digital
brain is that it knows what's important to your
computer – sharp, clear, easily downloaded images.

Crisp pictures begin with clear capture. Kodak's

highly photosensitive, full-frame CCD sensor,
combined with our patented color filter array pattern,
reads and captures images with amazing clarity.

Using a special compression algorithm patented
by Kodak, the *Digital Science* DC40 preserves
sharpness while minimizing traditional compression
effects. Some digital cameras eliminate pixels while
compressing pictures in standard resolution,

Type	CCD Still Frame Camera	Compatibility	PC and MACINTOSH computers	Depth	6.1 inches	Flash	1/8" x 1/4"
Image Size	1024 x 768 resolution			Width	5.3 inches	Batteries	4 AA (Alkaline)
Bit Depth	24-bit color	Capacity	48 meg-resolution 99 snapshot resolution	Height	2.2 inches		
Storage Memory	4.5 MB RAM			Weight	1 pound		



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With 4 MB of memory, this camera can store 48 high-resolution images before downloading onto your PC or MACINTOSH computer. Even its battery capacity is impressive. Expect 500 pictures before replacing the batteries.

And no camera carries the Kodak name until it delivers the rich, true color Kodak is known for. The DC40 is no exception.

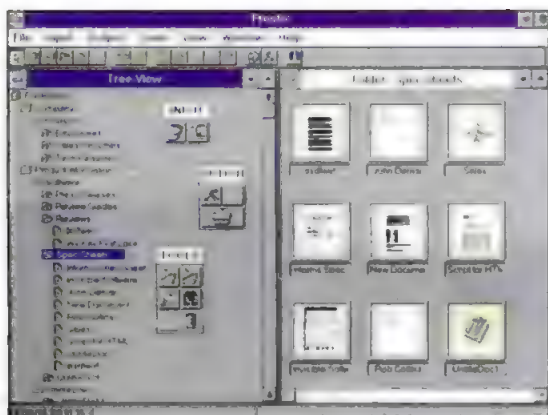
Kodak *ds*
digital science™

In addition to the DC40 camera, we've created a full line of integrated *Kodak Digital Science* products to work with your desktop computer. Photo CDs that digitally store your current photographs. Thermal printers that produce photographic-quality prints. And CD writers that store 650 MB to a single CD, to mention just a few.

To find out more about the affordable DC40 camera and other *Kodak Digital Science* products, contact your dealer or visit us on the Worldwide Web at <http://www.kodak.com/>

It's how you put pictures to work.™

CIRCLE 334 ON READER SERVICE CARD



Presto provides framed thumbnails of documents and pages, adding floating tool palettes for quick access to commands.

agers: OLE and direct fax integration are absent (although you can directly send a fax to your fax driver). The package also lacks support for VIM and MAPI.

There are two paths to getting documents into Presto: importing files and scanning paper. Presto doesn't actually import anything. Instead, it copies the file and generates a thumbnail of it. You can perform OCR only on scanned, not electronically imported, documents. Presto offers a variety of scanning options that let you scan to your fax, printer, word processor, and existing or new Presto documents.

Presto doesn't have red-lining or highlighting features, but it does let you attach notes to documents. You can drop OCR text into the notepad; copy, cut, and paste that text; and opt to make those changes a permanent part of your document.

The in-box lets you perform perfunctory batch processing: You can select the pages you want included in documents, and view and delete them.

Whether you're dealing with a file image or a scanned document, all roads lead to the Presto Filer module. The great thing about the filer is that you can use drop-down lists to specify quickly where you want your document to be stored. You can add a title, an ID, and keywords. Presto stores keywords in a global Keyword Dictionary, which you add to when you index.

Presto supports full-text, OCR-stream indexing—except for imported files—and index fields for keyword, date, title,

and document ID. You can search index fields by a form that supports Boolean AND and OR operators for keywords and regular expression searches of the document ID and date fields. The same form lets you search for exact matches on document title. Neither search facility supports any form of fuzzy logic.

Search results show up as a thumbnail with an expanded caption that lists the document's location. You can drag from this window to the appropriate tools, but you can't move or delete the file.

The OCR engine, by MacSoft Ocron, performed acceptably in our tests. It did have some difficulty with tables and text on shaded backgrounds.

Presto's cabinet/thumbnail display, coupled with its drag-and-drop abilities, eases the process of navigating and opening documents. But with poor OCR support and limited importing features, Envision's Presto falls somewhat short of magic.

Presto 1.3. List price: \$149. Requires: 8MB RAM, 10MB hard disk space (20MB recommended), Microsoft Windows 3.1 or later. Envisions Solutions Technology Inc., Burlingame, CA; 800-365-7226, 415-692-9061; fax, 415-692-9064.

Circle 463 on reader service card

Watermark Software Inc.

Watermark Enterprise Edition

The \$295 Watermark Enterprise Edition 2.01 delivers almost all of the features critical to a sophisticated document-management package. It has annotation, routing, and versioning alongside support for OLE 2.0, high-end batch-queuing features, and exceptional fax integration. Everything seems to be here, even MAPI and VIM support and network extensibility. But one serious omission hurts this other-

wise powerful software product: There's no support for full-text indexing.

Watermark does support optical character recognition (OCR); it also stores the text with the document and can export to the Clipboard or a variety of file formats. The problem is that it doesn't use that text to build an index.

WATERMARK'S WAY

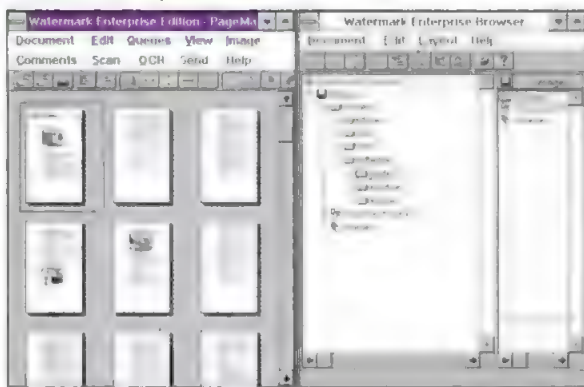
Watermark Enterprise uses a tree metaphor to organize information. You can set up and administer image servers, control document types, and set rights and permissions on the folder and document level.

Once you open a document from the browser or activate an OLE 2.0 object, many document-processing tools are at your disposal. Watermark Enterprise lets you highlight, red-line, adjust images, and add textual or graphical annotations.

Want to pull in information? No sweat. Adobe Photoshop, EPS, Quattro Pro, Microsoft Excel, Microsoft Word, WordPerfect, Harvard Graphics, and Lotus Freelance Graphics are among the formats supported.

You can scan single documents or batches and then send the information to the image viewer, to a queue for deferred processing, or to a folder.

OLE brings yet another input path to Watermark. Drag files directly into the browser, and you can embed objects into existing documents in the image viewer. On the flip side, you can quickly drag pages from the thumbnail view and embed them in other OLE 2.0-ready applications.



Watermark's sophisticated interface lets you navigate and annotate with ease.



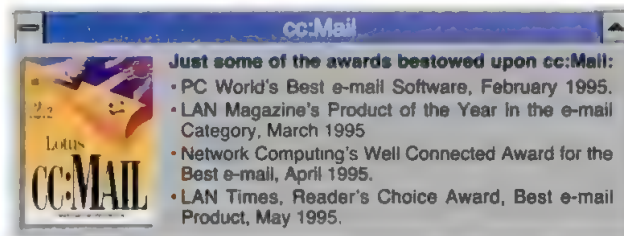
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have,
after all,
heaped
over 30
awards
on it.

From a strictly biased viewpoint, cc:Mail™ is the best, most proven, and the easiest to implement e-mail package in the world. But chances are, you'd appreciate a strictly unbiased viewpoint as well. In which case, we offer over 30 major awards won over the last two years by cc:Mail.

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GETTING ORGANIZED

Watermark Enterprise provides for effortless creation of document types and the structured templates that both sort and index documents. Sorting and indexing features are varied. You can view a batch as thumbnails and select a set of pages that will constitute a document. Choose the Tear-off command and you pop into the tabbed index dialog: Four tabs let you specify Basic, Folder, Keywords, and User Fields. Click OK, and your document is sent to the folder you specified.

MISSING ITS MARK

It's when you want to find your information that you'll begin to sense that something is amiss. The five-tabbed search dialog box lets you build a search based on the same tabs you specified in indexing, plus date. You can make use of regular expressions, but there's no support for Boolean operators.

Search results come up in the last tab of this dialog. Multiple columns let you sort by date, author, the name of the user who modified the document, and more. From this window, too, you can delete and move documents and send them to the browser. The Expervision OCR engine handled all of our text-input tests without difficulty. It's a shame Watermark doesn't take advantage of its accuracy for a full-text index.

For those who can live without full-text indexing, Watermark Enterprise is a superior package. For those who manage paper on the desktop in a small of-

Personal Scanners

If your desk is rapidly disappearing under a sea of paper, the solution may lie in a personal scanner. Unlike high-end flatbed scanners, these little peripherals aren't designed to read reams of reports. Instead, they're built to grab information off all the paper documents that cross your desk, including receipts for expense forms or numbers from a page for inclusion in a spreadsheet.

Personal scanners can do all this and more. In general, they're much cheaper and somewhat less sophisticated than more expensive scanners. They can't handle color (and some can't even scan 256-level gray scale), resolutions are typically limited to 300 dots per inch (dpi) or so, and although a few offer automatic sheet feeding of up to ten pages at a time, many are limited to a single sheet at a time.

On the other hand, personal scanners do much more than handheld scanners, the other once-popular low-cost option. Personal scanners scan the full width of a letter-size page, and they automatically feed the page past the scanner, which can greatly improve the scan quality.

OUR CRITERIA

To be included in this evaluation, a product had to have a list price under \$500 and be able to feed a sheet of paper automatically. We found eight products: Delrina Corp.'s WinFax Scanner, Info Products' ImageReader GS Personal Office, Microtek's PageWiz, Pentax Technologies Corp.'s DS6, Plustek's PageReader 800, Scanpaq's PageFX, UMAX Technologies' PageOffice, and Visioneer's PaperPort. Fujitsu Computer Products' ScanPartner Jr. comes in a variety of bundles, one of which would have met our criteria, but the company

submitted a version that included a SCSI interface card and Watermark Professional Edition software and carries a list price of \$629. Had it qualified for review, its performance and features would have placed it near the top of the pack.

MORE AFFORDABLE

The scanners fall into two price categories: \$199 or less, and \$300 or more. Most connect to the PC either to a parallel port or a proprietary interface, though the Visioneer uses a serial port and the UMAX comes with its own SCSI adapter. The software bundled with the scanners ranges from Spartan (in the case of the Pentax) to extravagant (the UMAX).

Almost all of the scanners include Twain-compliant drivers, making them easy to use with other Windows applications that support the Twain interface. A few also include support for

the new ISIS (Image and Scanner Interface Standard) interface.

So how do you pick among these personal scanners? Although parallel-port connections are convenient, the SCSI interface is more flexible. Scanners with multisheet feeders tended to be easier to feed, even with single sheets. Some models did better than others on tasks such as OCR accuracy. It's important to note here that this rating is not only based on the abilities of the scanner but also on how well the bundled software handles OCR accuracy. The key to picking the right unit is to look for the scanner that does best the kinds of tasks you need it for. In most cases, the street prices are less than \$200 apart, so price is not likely to be the deciding factor.

One fact is for certain, though. Until the paperless office arrives, a personal scanner can be handy to have around.

With one of these scanners, you can stay organized and avoid desk clutter. And the prices couldn't be better.

By Alfred Poor

SUITABILITY TO TASK

Watermark Enterprise Edition

	Power	Ease
Storage	Good	Excellent
Search	Fair	Excellent
Integration	Excellent	Excellent
OCR	Excellent	Good

fice, however, the lack of full-text indexing hampers the product's usefulness. **Watermark Enterprise Edition 2.01.** List price: \$295. Requires: 6MB RAM (8MB recommended, or 12MB to 16MB if scanning color images), 8MB to 14MB hard disk space, Microsoft Windows 3.1 or later. Watermark Software Inc., Burlington, MA; 617-229-2600; fax, 617-229-2989. Circle 464 on reader service card

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CIRCLE 095 ON READER SERVICE CARD

Delrina Corp.

WinFax Scanner

Delrina Corp.'s WinFax software helped create the Windows fax market, but users have discovered that fax modems have a drawback: Where do you put the piece of paper that you want to fax? Delrina now offers a solution: the WinFax Scanner.

With an estimated street price of \$329, the WinFax Scanner is priced in the middle of the pack, but it has more than just the average features. Like the Pentax DS6, the WinFax Scanner is based on the Avison scan engine, which was based on Fujitsu's design specifications; the FCC ID is in Fujitsu's name. The WinFax Scanner has 300-dpi resolution, 256-level gray-scale support, and a sheet-feeder that can take up to ten pages at a time.



Delrina's WinFax Scanner.

Installation and setup is quick and easy. The scanner uses a parallel interface and has a pass-through on the back of the case for a printer connection, so you only need a single parallel port. The scanner also has a separate power supply, a power brick that plugs into an AC socket.

The input slot has a center paper guide with an extension wire sticking up to hold pages to be scanned. There are movable edge guides that you can adjust for different-width pages, but they cannot slide close enough to accommodate a business card. The manual shows how the guides are designed to be swapped, left and right, so that they can work with business cards, but in our tests we found that the feeding mechanism was actually accurate enough

to feed a single business card successfully without moving the edge guides.

The scanner includes a Twain driver and a utility program that makes it easy to use scanned images for a variety of purposes. The software has some handy extra features, such as the ability to automatically straighten and clean images as they are scanned. You can print the scanned image to make a convenience copy, or send it to the included OCR module, which uses Xerox's TextBridge software. The software lets you save the image in a variety of graphic file formats for use in other programs. There's also a button you can choose to send the image as a fax via Delrina WinFax PRO 4.0, which is also included with the scanner.

THE NUMBERS

In our performance tests, the WinFax Scanner had average results. Its resolution measures of 284 dpi for both horizontal and vertical were above average, but its scanning-to-file speed was slower than most. The convenience-copy test speeds were also about average, though the two-step process of scan and print was not as convenient as with scanners that let you execute the process with one step.

The OCR results were weak; typefaces were not preserved, even though the program supports RTF (rich text format) output, and it didn't read snaking columns correctly. The WinFax Scanner also turned in the highest number of character errors in the group. On the other hand, the unit automatically reduced a legal page to fit a letter-size sheet when copied, and it had no problem with the multisheet and business-card tests.

Delrina backs the unit with a one-year parts-and-labor warranty, including a useful 48-hour replacement service.

If you already have a fax modem and have been thinking about adding WinFax PRO, then this is an affordable bundle that adds a scanner for not much more. Ultimately, though, the WinFax Scanner does not perform as well as some of the top products in the group. And if you're just looking for a personal scanner, you'll get more for your money elsewhere.

WinFax Scanner. *Estimated street price:* \$329. *Delrina Corp., San Jose, CA; 800-268-6082, 408-363-2345; fax, 408-363-2340.*

Circle 465 on reader service card

Info Products

ImageReader GS Personal Office

The ImageReader GS Personal Office from Info Products looks great on paper: gray-scale support, high scanning resolution, and an impressive software bundle, all for a bargain list price of \$199. Unfortunately, the practical performance falls short of expectations.

The Personal Office is based on the ImageReader GS scanner. This scanner uses the Plustek scan engine and relies on



The ImageReader GS Personal Office.

a proprietary ISA interface card (which doesn't require an IRQ setting) and cable, which are included in the package. There's no AC power required; the scanner gets power directly through the interface card.

The unit is rated at an engine resolution of 200 dpi, with interpolation to 800 dpi. It's a single-sheet-only scanner; pages feed through a front slot and exit through the rear. The unit comes with a calibration sheet that you scan after installation in order to adjust the configuration settings for the individual unit. The scanner is then automatically tuned according to the results of the scanned calibration sheet.

The scanner comes with a Twain-compliant driver, as well as Caere's Personal PageKeeper 2.0 for OCR and document management, and Ulead Systems' ImagePals GO! for image scanning and editing. The Twain driver is more sophisticated than that found in some competing products in that it provides prescan previews and scan-area sizing; it also includes standard features such as brightness and contrast controls. The driver has "sticky" settings that remain in effect until you change them.

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NOT ALL IT SEEMS

From a practical viewpoint, however, the ImageReader isn't as attractive as the features might suggest. One of the biggest problems is the paper-feed mechanism. In our tests, it often took two hands to feed the paper into the slot reliably. Sometimes the paper took a while to catch, which occasionally resulted in the unit only scanning the first few inches of the page. Not only are the edge guides set permanently for letter-size pages, but they're so small as to be ineffective, and we often had pages slip over them and skew as they traveled through the scanner. The feeder couldn't handle a glossy photograph at all; it would slip and slide as it passed through the scanner, making it impossible to get an acceptable scan. The business-card scan was fine, though.

Another problem arose during installation. The package includes "Info Technician," a hardware diagnostic based on CheckIt Setup Advisor, which locks on some computers when run under Microsoft Windows for Workgroups 3.11. We had to disable this feature in order to get the software to install properly.

The performance results were mixed. The unit was fast on the convenience-copy tests, though the only way to perform the task was to scan the image into one of the bundled applications and then print it, which is far less convenient than other packages in the group. The test procedure called for the scanner to be set at 200 dpi for the copy test, but when the resulting image was printed on the 300-dpi LaserJet, it was reduced in size by two-thirds—the only program in the test group to do this—and the smaller print stream could explain the faster results.

The ImageReader was about average in the OCR conversion and scan-to-file tests. OCR conversion accuracy was about average, with most of the character errors occurring with 8-point Times Roman. The product did a good job of retaining the font typefaces and point sizes but failed to read the snaking columns correctly.

True to its higher-than-average scan-resolution specifications, the unit tied for second best in the vertical-resolution test, turning in a 320-dpi scan. Unfortunately, the horizontal-resolution results were not

on a par with the vertical numbers; the scanner trailed the rest of the pack with a measure of just 203 dpi.

The lack of integration in the software packages, the mixed performance results, and the difficulty in getting accurate feeds and scans outweigh the ImageReader GS Personal Office's attractive specs and low price.

ImageReader GS Personal Office. *List price: \$199. Info Products, Campbell, CA; 408-374-7290; fax, 408-378-1068.*

Circle 466 on reader service card

Microtek Lab Inc.

Microtek PageWiz

At \$199 (estimated street price), the Microtek PageWiz is an affordable personal scanner that offers gray-scale support and 300-dpi scanning and uses a convenient parallel-port connection. Mixed performance results, however, dull the excitement of its low-price appeal a bit.

Installation and configuration are both a snap. The unit plugs into a parallel port on your computer, and your printer plugs into the back of the scanner. There's a separate power adapter that plugs into an AC outlet. The scanner comes with Microtek's PageSuite software and Caere's OmniPage Limited Edition for OCR conversions. A Twain-compliant driver makes it easy to use the Microtek PageWiz scanner with either the bundled software or other Windows programs.

A QuickPanel Windows utility makes it easy to copy, fax, or save scanned images with the touch of a single button. The PageSuite application provides more control over options and adds other features, including document management with folders and keyword searching.

WIZ-BANG

The scanner's driver provides only limited control. Settings are easy to make, but they use nontechnical terms. For exam-

ple, you can choose among Normal, Fine, and Extra Fine, but nowhere is it explained that these correspond to 100-, 200-, and 300-dpi scan-resolution settings. Furthermore, you only get five Density (brightness) choices, which limits your ability to optimize scan results.

Built around a Microtek scan engine, the PageWiz is the only single-sheet feeder unit in this feature that feeds from the top instead of the front. This proves more convenient, since you can place the scanner up against a wall or the side of your PC without obstructing the paper path.

In our performance tests, the unit produced mixed results. For example, it was about average on some of the scan-to-file and convenience-copy tests, but slower than average on others. It was about average on the OCR-conversion test, and the OmniPage LE software had the highest character accuracy of the group, but it did not retain font typefaces and it scrambled the snaking column text.

The PageWiz does support gray-scale scanning, but only at 4-bits per dot, which limits images to just 16 levels of gray.

Scans of the test photograph revealed strong signs of posterization, making this scanner poorly suited for scanning photographic images. In addition, the Twain-compatible driver did not work with all the programs we tried with the PageWiz. According to a Microtek representative, the driver only supports memo-

ry transfers, wherein the Twain data is held in memory and sent directly to the application. Right now, not all programs support memory transfers, which are part of the new Twain 2.0 specification. File transfers, wherein the data is stored in a temporary file and sent from there, are more commonly supported.

The unit's paper-feed tray doesn't have adjustable edge guides. The scanner worked fine for the letter-size pages, but the business card skewed when it was fed through the scanner. At default settings our convenience copy of the legal-size



The Microtek PageWiz.

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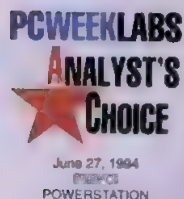
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• 21" Micron 21FGx, 1600NI, .28mm

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*Option D not available in desktop

page came out cut off at the bottom, but the software does have a "shrink to fit" option that resolves this problem. An optional ten-page sheet-feeder is available from Microtek and retailers.

In the resolution tests, the PageWiz performed poorly. It managed 254 dpi on horizontal resolution, but only 183 dpi for vertical resolution, which was by far the lowest mark in that measure. It's likely that this result could be improved if the brightness control provided finer adjustments.

The PageWiz has an attractive price and its software does an adequate job with most personal-scanner tasks. Its limited gray-scale support makes it unsuitable for scanning photographs, however, and the slow performance reduces its appeal. The main remaining attraction is the OCR-character accuracy, but you can achieve nearly the same performance with some competing products, especially if you're scanning documents with larger than 8-point type.

PageWiz. Estimated street price: \$199. Microtek Lab Inc., Redondo Beach, CA; 800-654-4160, 310-297-5000; fax, 310-297-5050. Circle 467 on reader service card

Pentax Technologies Corp.

DS6



Other personal scanners may have flashier monikers, but the Pentax DS6's prosaic name hides the fact that this scanner is one of the most attractive models in this evaluation. Although it doesn't have the most versatile software, it's an excellent product to which more capable software can be added.

With a list price of \$499, the DS6 is at the high end of this group's price range. It's based on an Avison scan engine (the same used by the Delrina unit) but with some special differences. Whereas other scanners using this engine are rated at 300 dpi, the Pentax has an engine resolution of 300 dpi by 600 dpi, with interpolation bringing it up to 600 dpi in both dimensions.

Unlike the Delrina model, the DS6 uses a parallel interface. You can choose either a proprietary ISA interface card or

a special adapter to connect it to a standard parallel port. We tested the unit connected to a standard parallel port for two reasons: First, this installation doesn't require opening the case—a fact that will likely appeal to many users. Second, the copy feature only works when your printer is plugged into the back of the scanner, which leaves your parallel port open.

QUICK COPY

Most personal scanners rely on Windows print drivers and Print Manager to make convenience copies, but the Pentax can bypass your PC entirely. If you connect a laser printer via the scanner's parallel-pass-through connector and press the button labeled "Start" on the top of the scanner, all the pages in the unit's input tray are automatically scanned and then reprinted by the laser printer.

One minor downside of this feature is that you can't configure the settings for the copies; they're automatically made at 300 dpi. As a result, the Pentax was one of the slowest units on the convenience-copy tests.

The Twain-compatible driver had the most sophisticated settings of any of the units tested. You can preview the image, set the scan rate and resolution, choose to scan just a portion of the image, and more. The Pentax should provide more than adequate support for Twain-compliant applications.

The DS Scan software that comes with the DS6 is less impressive. It does little more than the basics; you can scan, save, and print images with limited editing functions. Forget about any OCR, annotation, or extensive document-management features.

In other performance tests, the DS6 was above average on the scan-to-file tests. It had no problems with the business card or multisheet feed tests, and while it cut off the bottom of the legal-page convenience copy, the DS Scan software does

have a shrink-to-fit print option.

Resolution results really set the DS6 apart from the rest. Its 361-dpi vertical resolution was the best of all, and the 284-dpi horizontal resolution was tied for the best; and there was only slight vertical banding in the gray-scale photograph scan.

Aside from the Twain-compliant driver, the software included with the Pentax DS6 doesn't make much of an impression. But if you're in the market for an affordable personal scanner that you want to use with Twain-supporting software of your own choosing, then the Pentax is difficult to beat. With high-

quality scanning and the added convenience of one-button copies that don't tie up your computer, the Pentax is an excellent choice.

Pentax DS6. List price: \$499. Pentax Technologies Corp., Broomfield, CO; 800-543-6144, 303-460-1600; fax, 303-460-1628.

Circle 468 on reader service card



Pentax's DS6.

Plustek U.S.A. Inc.

PageReader 800

The Plustek PageReader 800's \$199 list price makes it one of the most affordable units in this evaluation. You get a gray-scale, single-page scanner rated at 400 dpi resolution, plus OCR software. The scanner has its strong points, but it falls short of the marks set by the top competitors.

As you might expect, the PageReader 800 is based on the Plustek scanning engine—the same one used by the Info Products and Scanpaq entries—which supports 256-level gray-scale scans.

A CLOSE RELATIVE

The Plustek unit has a lot in common with the Scanpaq PageFX. They both use the Windows-based Action Manager utility to provide quick access to scanning functions. You simply click on an icon to scan an image directly to a file,

Performance Tests: Personal Scanners

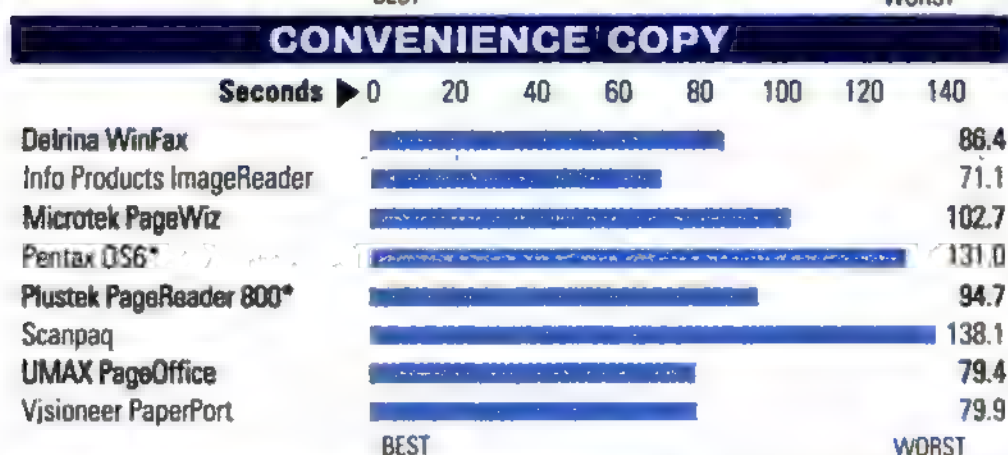
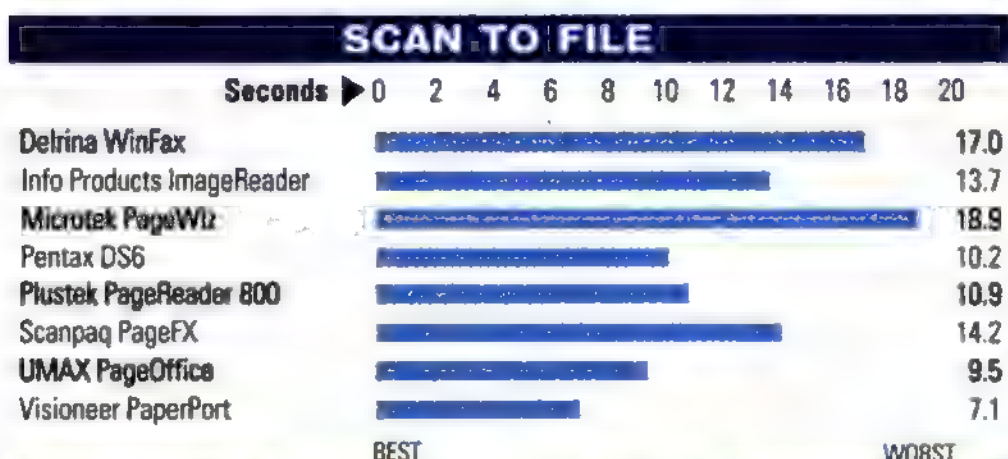
None of the scanners in this category are speed demons. But when processing a raw scan-to-file task that minimally engages the operating system, most of them perform quite well. Bottlenecks appear as software layers become busy facilitating operations such as printing and OCR.

What the Numbers Mean

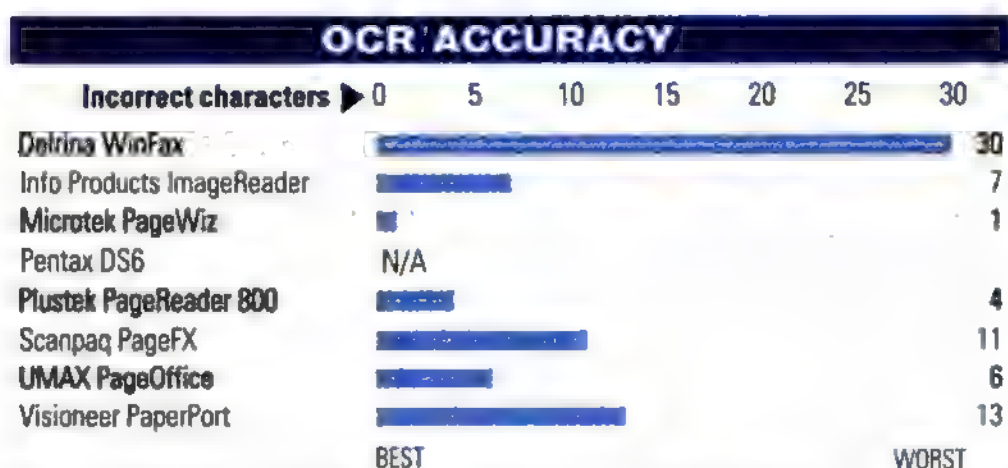
The Scan to File and Convenience Copy tests are both timed tests. Lower numbers indicate faster performance.

The Scan to File test is a good indicator of a scanner's speed, because it tests all the units at the same resolution and gray-scale depth. Results vary widely. Some units feed the paper through the scanning mechanism faster; others either move it more slowly or pause more frequently. The Visioneer PaperPort, with its serial connection, was the fastest, followed by the Pentax, Plustek, and UMAX units. Visioneer's speed is more attributable to its 1-bit scan resolution, though.

The Convenience Copy test shows how quickly an image can be scanned and sent to the printer, reflecting how well the device can be used in place of a photocopier. Note that



*The products performed this operation at 300 dpi instead of 200 dpi



N/A—Not applicable: The product did not come with software that could perform this test

three of the scanners—the Pentax, Plustek, and Scanpaq—make their copies at 300 dpi instead of the 200-dpi resolution specified for this test. These settings could not be adjusted; hence a larger data stream was sent to the printer, resulting in slower performance for all three units. The Info Products ImageReader GS Personal Office posted the best time, with the UMAX and Visioneer close behind.

The OCR Accuracy test measures the number of errors made by the scanner and its bundled software in recognizing the 2,577 characters on the test page. We report the total number of character-identification errors made by each product. The bulk of the errors came on the 8-point Times Roman text sample; most of the remaining errors occurred on the 8-point Arial sample. The Microtek PageWiz was the clear winner in this test, with only one error, but the Info Products, Plustek, and UMAX were close behind. Except for the 8-point Times Roman portion of the test, these units had only two or three errors each.

How We Tested

We tested these personal scanners across a range of tasks that reflect the broad mission for which they are intended. The tests break into four main categories. On all timed tests, we ran three trials and reported the average time.

The test-bed was designed to reflect the fact that these devices are aimed at the single-user market; hence they are not likely to be run on the latest or most powerful systems. We used a system with a Pentium/75 processor and 8MB of RAM, plus an HP LaserJet Series II printer.

We do not report certain test results but instead discuss them in the reviews; these involved straightforward tasks that we rated on a pass/fail basis. We used the copy (or scan and print) feature with a legal-size page of text to see whether the image would be reduced to fit the letter-size paper in the printer or whether the bottom would be cut off. Some units that cut off the bottom did have options to reduce the image to fit. We used a five-page document to test multisheet feeding on scanners that had this feature.

We tested business-card scanning on a standard-size business card printed on glossy coated paper. For the photo test, which was timed, we scanned a black-and-white glossy photo at the highest supported gray-scale depth at 200 dpi.

We also scanned a PM-189 Scanner Test Target in black and white. The Scanner Test Target image is a line-art test page with sets of horizontal, vertical, and diagonal lines spaced at various resolutions. We calculated the score at the highest resolution at which all lines were visible in the image. We made repeated scans of the test target, adjusting brightness and other settings until we got the best possible result.

For the Scan to File test, we scanned a single page of mixed text in black and white at 200-dpi resolution and saved it to a TIFF file format. If the software did not support this as a single step, we timed the scan and save steps separately, then reported the combined times.

For the Convenience Copy test, we scanned the page of text at 200 dpi on the black-and-white setting and sent it to the printer. If the scanner had a copy function, we used it. Otherwise we used the scanner software to scan and print the image, then reported the combined times for those two steps.

For the OCR Accuracy test, we scanned and converted the mixed-text test page, using a black-and-white setting at either the highest resolution or at the recommended resolution.—*Analysis written by Alfred Poor*

your printer, or an application. The program comes with a number of preset action icons, but you can alter these or add your own.

NOT COMPLETELY ALIKE

On the other hand, the Plustek also has some significant differences from the Scanpaq model. It comes with its own proprietary interface card (which does not take up an IRQ assignment) and cable. Furthermore, the Plustek uses a Twain driver by default, which worked well with software that supported it.

The documentation remains weak, although it's an improvement over Scanpaq's. The installation instructions direct you to modify your computer's CONFIG.SYS file by hand, although the installation software actually does this automatically.

The PageReader 800 had average or better results in the performance tests. It was about average for the convenience-copy tests, even though the copies

and was not too accurate on point size, but had one of the lowest character-error scores and managed to recognize the text sequence in the snaking columns in our test document.

Another noteworthy accomplishment is that the PageReader was the only Plustek engine unit that scanned the glossy test photograph reliably. Unfortunately, it still had the same feeding difficulties and ineffective edge guides that caused some problems with the Info Products and Scanpaq units.

Resolution scores were disappointing, especially in light of the unit's 400-dpi specification. The PageReader only managed 254 dpi vertically and 229 dpi horizontally. (The Scanpaq had the same scores.)

The scanner doesn't come with any document-management software, though a company representative said Plustek will be adding a package to the bundle later this year.

The PageReader 800 is an acceptable compromise solution if you don't need document management and are looking for a budget choice. But for a little more money you can get better resolution and easier paper handling with one of the other scanners covered here.

PageReader 800. List price: \$199. Plustek USA Inc., Sunnyvale, CA; 800-685-8088, 408-745-7111; fax, 408-745-7562.

Circle 469 on reader service card

Scanpaq Inc.

PageFX

The PageFX, from Scanpaq, carries the same suggested retail price of \$199 as the other two units based on the same Plustek scan engine (the Info Products and Plustek models), but it has some unique features. Unfortunately, none of these are sufficient to lift it above the rest of the pack.

Unlike the other two close relatives, the PageFX connects to your computer's parallel port instead of using a proprietary interface card. The scanner does

not have a pass-through port for your printer, however, so Scanpaq provides an external box that provides pass-through service via a built-in interface card. The box adds a bit to your desktop cable clutter, but the device does make it possible to connect the scanner and a printer to

the same port. The unit requires external power.

MORE OF THE SAME

The PageFX includes the same Action Manager utility software and Recognita Plus OCR software as the Plustek unit, but it also adds document-management software in the form of PaperMaster SE from DocuMagix.

The Scanpaq documentation leaves a bit to be desired, not to mention the fact that it'll probably puzzle some novice users. For example, you are advised that "to keep the scan quality well, the scanner must be make shade first." This serves as a prelude to instructions for feeding a strip of paper marked "Calibration Sheet" through the scanner to calibrate it.

The install program loads both Twain- and ISIS-compatible drivers, though it uses the ISIS version by default.

Like the Info Products scanner, the PageFX wasn't able to feed the glossy test photograph reliably. And like the Plustek model, it achieved resolutions of 229 dpi horizontal and 254 dpi vertical. What's more, the PageFX suffers from the same immovable edge guides and unreliable sheet feeding as the other two units.

SCAN EFFECTS

The PageFX scanner was faster than average on the text page scan-to-disk test, but was slowest of all on the convenience-copy test and slower than average on the OCR-conversion time. The OCR results were poor, with an above-average number of character errors and no retention of font typeface or effects. It did, however, manage to keep the sections of snaking column text together correctly.



The PageReader 800.

scanned automatically at 300 dpi (instead of the 200 dpi called for in the test procedures) which increased the amount of data that was transferred to the printer. The copy process only took one step; most other scanners in the group required separate scan and print steps. And although the default settings did cut off the bottom of the legal-size test copy, the software includes a reduce/enlarge option that makes it possible to make a successful copy.

The scanner was above average on the scan-to-file tests and on OCR-conversion time. The bundle includes Recognita Plus software, which did an excellent job on the OCR task. The program failed to retain the font typefaces



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¹U.S. list price as of 8/1/95 for 486/66MHz. Model 1. ²U.S. list price as of 8/1/95 for 66MHz Pentium processor. Model 1. ³U.S. list price as of 8/1/95 for 75MHz Pentium processor. Model 1. ⁴U.S. list price as of 8/1/95 for 100MHz Pentium processor. Model 1. In Canada, call 1-800-387-3867. Microsoft is a registered trademark and Windows NT and the Windows NT Logo are trademarks of Microsoft Corporation. The Intel Inside and Pentium[®] processor logo are registered trademarks of Intel Corporation. UNIX is a registered trademark in the United States and other countries, licensed exclusively through X/Open Company Limited. © 1995 Hewlett-Packard Company PHC419



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SUMMARY OF FEATURES

Personal Scanners

	DeIrina WinFax Scanner	Info Products Image Reader GS Personal Office	Microtek PageWiz	PC MAGAZINE EDITORS' CHOICE Pentax DS6	PlusTek PageReader 800	ScanPac PageFX	PC MAGAZINE EDITORS' CHOICE UMAX PageOffice	Visioneer PaperPort
■ YES ■ NO								
Products listed in alphabetical order								
Price	\$329 (street)	\$199 (list)	\$199 (list)	\$499 (list)	\$199 (list)	\$199 (list)	\$499 (list)	\$399 (list)
Engine manufacturer	Avision	Plustek	Microtek	Avision	Plustek	Plustek	UMAX	Visioneer
Dimensions (HWD, in inches)	3.6 x 11.6 x 4.2	3.5 x 12.2 x 3.3	2.2 x 11 x 4.3	3.5 x 11.6 x 4.3	3.3 x 11.3 x 2.8	3.3 x 11.3 x 2.8	5 x 13 x 5	3.5 x 12.5 x 3
Weight (pounds)	3.5	1.7	2.4	3.5	1.7	1.5	5.0	2.5
Scan Area								
Maximum height (inches)	14	14	14	14	Unlimited	14	14	30
Maximum width (inches)	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
Gray-scale support	8-bit	8-bit	4-bit	8-bit	8-bit	8-bit	8-bit	1-bit
Resolution (dpi)	300 x 300	200 x 200	300 x 300	300 x 600, 600 x 600	400 x 800	400 x 800	300 x 300	200 x 400, 400 x 400
Automatic form-feed	■	■	■	■	■	■	■	■
Maximum number of sheets user can load	10	1	1	10	1	1	10	1
Brightness/contrast controls	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Document copying	■	■	■	■	■	■	■	■
Front-panel controls	■	■	■	■	■	■	■	■
Software activation	■	■	■	■	■	■	■	■
OCR software bundled	■	■	■	■	■	■	■	■
Document management software bundled	■	■	■	■	■	■	■	■
Other software bundled	Leadview Lite, WinFax PRO	ImagePals Go!	None	None	None	None	PageImage, PageType	None
Interface								
SCSI port	■	■	■	■	■	■	■	■
Type of SCSI adapter included	N/A	N/A	N/A	None	N/A	N/A	DTC Technology	N/A
Parallel port	■	■	■	■	■	■	■	■
Serial port	■	■	■	■	■	■	■	■
Proprietary interface	■	■	■	■	■	■	■	■
Twain-compatible	■	■	■	■	■	■	■	■
Warranty (parts and labor)	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year

N/A—Not applicable: The product does not have a SCSI port.

Overall, the Scanpac PageFX lacks the speed, scan quality, paper handling, and ease of use that it takes to be a top contender in this category.

PageFX. List price: \$199. Scanpac Inc., Pomona, CA; 909-622-5698; fax, 909-622-6768.

Circle 470 on reader service card



Scanpac's PageFX.

UMAX Technologies Inc.

PageOffice



Speed, quality, accuracy, feature-rich software: If these are the traits you're looking for in a personal scanner, then the PageOffice, from UMAX Technologies, should be on your short list. At \$399, it's priced close to the top of our filter, but you'll get your money's worth.

To begin with, the scanner is a little bit larger than most of the competitors in this group, but it's not the largest. PageOffice is also the only one with a SCSI interface. This has distinct advantages over parallel or proprietary interfaces. And in case your system doesn't include a SCSI interface with ASPI support, PageOffice comes with a jumper-

less, self-configuring DTC Technology UDS-IS11 ISA card.

WHAT'S IN THE BOX

The 300-dpi scanner supports 8-bit gray-scale scans, comes with a Twain-compliant driver, and features an impressive suite of integrated Windows applications. PageManager is the hub. Scanned images are loaded into this application by default; there you can annotate, crop, or print them, or convert them to text using the built-in OCR function. Across the bottom of the screen, you'll find a row of buttons for the other functions. One, a fax function, lets you send an image through a fax modem without requiring any additional software. Also included is the versatile image editor, PageImage, and PageFile, a simple document-management utility that supports keyword searches.

The third utility, PageType, is surpris-

Document/Image Management

ingly handy. It lets you scan a form—such as a registration card—and fill in the blanks on-screen. You can then print the complete image, or you can print just the added information; feed the original blank form through your printer and you get a neatly typed final result. You can also add your own applications to the row of buttons.

The PageOffice scanner has two buttons, labeled "Document" and "Photo." These too can be programmed, including whether the image is to be scanned as line art or gray-scale, the resolution, and the destination application. So, for instance, you can program the Document button to scan a document, automatically convert the image, and send the text to your word processor.

The PageOffice performance figures back up its superb features. It was either



UMAX's PageOffice.

the fastest or above average on all tests. The quality of the scanned photo was excellent, with the only visible flaw being one small, vertical, light streak. The multisheet test worked without a hitch, and the sliding edge guides made it easy to feed a business card without skewing. And the 284-dpi resolution in both directions was among the best in the field. The OCR character-error count was below average, and the bulk of the errors were made on the 8-point Times Roman text. Many users won't be scanning in 8-point type often. The OCR engine is based on the MacSoft Ocron engine.

NOBODY'S PERFECT

There are some areas that could be improved. The Twain driver provides relatively few controls and does not have a

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preview or crop feature. There's no option to shrink a scanned legal page to fit on a letter-size sheet (though you can specify legal page output in your printer driver). Convenience copies can be triggered by a single step (including one of the buttons on the scanner), but they run through Windows' Print Manager and you have to confirm the settings in the Print dialog box, adding a second step to the process.

Although the OCR conversion process is able to identify typefaces and other details, the program only sends the text without formatting to receiving applications. A new version of the PageOffice software, which missed our deadline, should let you send text with formatting.

The version of PageOffice we tested was an FCC Class A (not certified for home use) product, the only one in our roundup. PageOffice originally had Class B certification, but it had to be resubmitted after UMAX made changes to the hardware. The product should be Class B by the time you read this.

If you want a bundle that makes it eas-

ier to manage the interaction between your computer and the paper in your office, the UMAX PageOffice is one of the top contenders. There are some compromises involved here, but overall it provides the best value in terms of features and performance.

PageOffice. List price: \$399. UMAX Technologies Inc., Fremont, CA; 800-562-0311; 510-651-8883; fax, 510-651-8834.

Circle 471 on reader service card

Visioneer Inc.

PaperPort 2.0

The PaperPort, from Visioneer, has an estimated street price of \$369, which places it above the average price for this group, but a number of unique features set it apart from the rest of the pack. Some could be considered advantages, but others may be too limiting for some users.

First off, this is *not* a gray-scale scanner. It's the only product in the group that scans no more than one-bit (black-and-white) images. If you want to use a scanner to add photographic images to your

documents, the PaperPort is not for you. A new version of PaperPort, due in the fall, will be a gray-scale personal scanner. Other details, including the price of the new hardware/software bundle, were not set at press time.

The PaperPort is a single-sheet scanner, based on Visioneer's own scan engine. Like most of the other single-sheet scanners in this review, you push the page into the front slot of the unit, and the paper can travel a straight path and emerge out the back. Unlike the others, however, there's a part of the top of the case that rotates slightly and changes the paper path to a C shape, so that the paper makes a 180-degree turn and returns out the front of the scanner. This is a real space-saving convenience.

The PaperPort is the only personal scanner in the group that relies on a serial interface. Serial ports may be at a premium for many users, but if you have one available, hooking up the Visioneer scanner is easy. The only other connection is power.

The PaperPort software is clearly tar-

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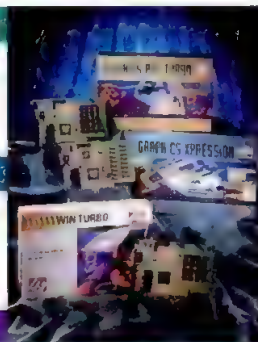
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In the scanning and convenience-copy tests, the PaperPort was one of the fastest in the group. Caere's WordScan OCR software, built into the PaperPort, turned in one of the slowest OCR-conversion times; this was the scanner's only poor showing. The character-accuracy results were somewhat mixed, but the problems were largely limited to the 8-point type sections. The scanner handled the snaking text columns well but scrambled the columns that had boxed text. It did not retain the typefaces, but did preserve the point size. On the convenience copy of the legal page, the PaperPort automatically reduced the copy to fit on a letter-size page. Delrina's WinFax Scanner was the only other scanner to manage this reduction with default settings, although a few of the other scanners

do have optional reduction features.

We encountered some problems during our tests. Like other front-fed, single-sheet scanners reviewed here, it was difficult to feed the page accurately without using both hands. And even then, the small, fixed-position edge guides were of little help. If the page skewed during scanning and ran up against the edge of the



Visioneer's PaperPort.

scanner, the scan process would abort. It did spit the page back out, but not until after the edge of the page was torn a bit. And while the business-card scan worked, the lack of guides meant that you simply feed the card anywhere you want on the scanner. The card was scanned in, in fact,

at an 8.5-inch width; the scanner didn't recognize that it was scanning in a business card.

Because the Visioneer's proprietary driver isn't Twain-compliant, the scanner's utility is limited. However, you can create a link to more than 75 different supported applications, creating a button at the bottom of the workplace screen. You drag a scanned document and drop it on an application's button to open it.

Compared with the competition, the Visioneer PaperPort doesn't offer much more than speed. The lack of gray-scale support may be too limiting for many users, and in spite of the scanner's speed and document-management software, there are other scanners that provide more features at equivalent or better prices. The next version of the PaperPort should be a much more competitive product. □

PaperPort. Estimated street price: \$369. Visioneer Inc., Palo Alto, CA; 800-787-7007; fax, 415-885-9750 (sales), 415-493-0399 (technical support).

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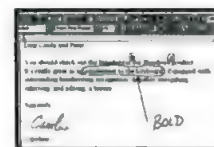


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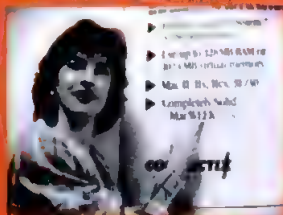
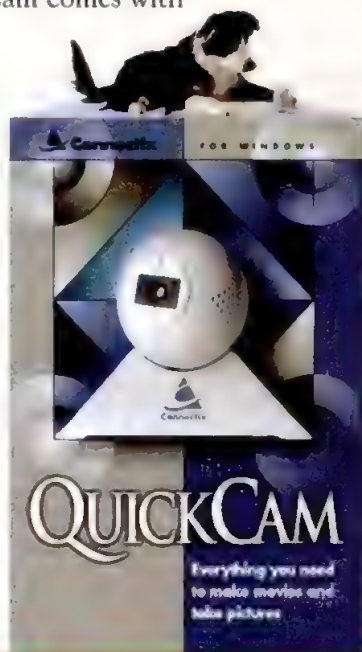
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PowerPC: A Work In Progress



By Jim Seymour

Oh, PowerPC, you're a heartbreaker. You promised so much, we expected so much . . . and so little has come of such great ideas.

We've been watching the PowerPC market, such as it is, for two years now. We thought the time was right to put this new, emerging class of ultrapowerful, highly affordable machines on the test bench to see just how far they've come. We started rounding up machines.

Without much success, as it turns out. Despite announcements from Austin/IPC Technologies, Canon Computer Corp., IBM, and Motorola—and from FirePower, a start-up created by former NeXT hardware engineers to produce PowerPC motherboards for clone makers—when it came time to flip on the power switches and run the performance tests, we had exactly two PowerPC computers running Microsoft Windows NT Workstation 3.51 in PC Magazine Labs. One was IBM's Power Series 850; the other, Motorola's PowerStack DT604-133NTW. For comparison, we

PowerPC systems running Windows NT are finally here, but their prospects are questionable. Compared with Pentium PCs, they don't offer significant advantages in performance or price, and native software remains rare. PC Labs examines the machines that were supposed to redefine computing.

included an Apple Power Mac 9500/132 running Apple's System 7.5.2. (We also reviewed a PowerPC system from Austin and a PowerPC notebook from Canon in First Looks, August 1995.)

All three of the systems we tested use the latest, fastest chip in the PowerPC line, the 133-MHz PowerPC 604. (For a comparison with other PowerPC chips, see the sidebar "The PowerPC Family Tree.") To see how the machines stacked up, we also ran our performance tests on Tangent Computer's MediaStar 5133, a

recent Editors' Choice winner (September 26, 1995) that uses a 133-MHz version of Intel's Pentium CPU. All four units had 64MB of RAM installed; although we also did some testing of the PowerPC systems with 32MB, we found them especially memory-hungry and recommend 64MB as a realistic base configuration.

Other PowerPC vendors backed off, either because their systems weren't ready for review at all or because they were making a transition between products—introducing versions with faster processors and the like.

Despite the paucity of machines we found, despite the delays and forfeited opportunities, PowerPC machines may still have a role to play in the PC market.

Our Contributors: JIM SEYMOUR is a contributing editor of *PC Magazine*. DANIEL GROTTA and SALLY WIENER GROTTA are frequent contributors to *PC Magazine*. ANUSH YEGYAZARIAN is a staff editor at *PC Magazine*. JOHN CLYMAN was the associate editor in charge of this story, and CHARLES RODRIGUEZ, product testing manager at PC Magazine Labs, was the project leader.

And the story of how and why the PowerPC revolution has *not* yet happened is almost as interesting as it would have been if this new chip design had lived up to the advance publicity. Besides, we learned a lot comparing these three machines—and contrasting their performance to that of current Pentium machines.

THE BURDEN OF GREAT PROMISE

Ever since development of the new PowerPC family of microprocessors was

announced in 1991 by a joint venture formed by Apple, IBM, and Motorola, PC users, PC buyers, and PC gurus have all looked forward to thumbing their noses at Intel's hegemony in the PC market.

The PowerPC chips were going to be the highest expression yet of RISC design in microprocessors. With the current leading RISC designs—Hewlett-Packard Co.'s PA-RISC, MIPS' R4x00, and Sun Microsystems' SPARC—getting a little

PowerPC vs. Pentium: The Bottom Line

By John Clyman

The PowerPC's siren song is sweet: an alternative to the x86 architecture that performs better, at a lower cost, and is still compatible with all your existing software. Coming from companies with the reputations of Apple, IBM, and Motorola, it sounds remarkably compelling. The \$64,000 question, of course, is: Will the PowerPC deliver?

Let's examine some of the claims we've heard for the PowerPC and see how well they have stood up.

First claim: The PowerPC is faster than the Pentium. Defining "faster" across different computing platforms is a tricky task because isolating the hardware from the software that runs atop it is nearly impossible. The results of our performance tests indicate that while the PowerPC-based machines can outperform a Pentium system in some circumstances, software optimization is critical. Microsoft Office, for example, is a suite of applications far more highly optimized for the x86 platform than for PowerPCs running Microsoft Windows NT or for the Power Macintosh, which results in a tremendous performance discrepancy. To cite just one example: A spell-check that was essentially instantaneous in Microsoft Word on a Pentium took a full minute on a Power Mac—not because PC hardware is

faster, but because Microsoft wrote the spell-checking routines differently for each system.

This could change if the PowerPC takes off and software developers devote themselves to optimizing performance for the PowerPC. But as long as the x86 family has a dominant market share, we expect vendors to pay less attention to the performance of PowerPC versions of their programs, which could negate any potential advantage that PowerPC hardware may offer.

Second claim: The PowerPC is less expensive than the Pentium. The 133-MHz PowerPC 604 is fabricated on a smaller die (rectangular chip of silicon) than a 133-MHz Pentium, which means it should cost less to manufacture. Because of Intel's aggressive pricing, that expectation is not reflected in the publicly quoted 1,000-unit pricing for the two processors (\$756 for the PowerPC, \$694 for the Pentium). But we suspect that as a PC buyer, you're not concerned with the cost of the processor as much as the out-of-the-door cost of a complete system. Commodity-priced x86-based PCs have an undeniable advantage there—intense competition has driven the street price of a fully equipped Pentium/133 system to well under \$4,000. The Pentium machine we used as a comparison for this story had

64MB of RAM and sold for \$5,295, compared with prices of \$7,000 to nearly \$10,000 for the PowerPC systems tested here.

Third claim: The PowerPC runs all your existing software. True, with a caveat. Both Windows NT and Apple's System 7.5.2 for the Power Macintosh include built-in emulators that will run programs not designed to support the PowerPC. Although emulators have gotten better, they're still relatively slow; they're really acceptable only for applications you use infrequently. (Think of it this way: Even if the emulator runs your software as fast as a 486DX2 PC, why pay upwards of \$5,000 for a system with that level of performance?) Remember, too, that PowerPC systems may not run the operating system you want: They won't support Microsoft Windows 3.1 or Microsoft Windows 95 at all, and OS/2 support likely won't be available until about the end of the year.

Native applications for the PowerPC are still rare on the PC side of the fence. (Apple has done a far better job of enticing software developers to port their applications, in part because there's no question that the PowerPC family represents the future of the Apple platform.) The only applications ready for us to test under Windows NT were Avid Technol-

long in the tooth, and with Digital Equipment Corp.'s Alpha RISC chips new and largely untested, the PowerPC was going to have an easy path to success. PowerPC chips were going to be smaller, cooler and faster—the conventional physics of silicon engineering notwithstanding—and cost half the price of comparable Intel chips. Backed by the combined manufacturing and marketing muscle of Apple, IBM, and Motorola, how could they go wrong?

PowerPC processors, it was promised, would soon lie at the heart of revolutionary new computers from Apple and IBM—machines that would revitalize those companies' moribund lines. And because Apple and IBM would agree on a

Common Hardware Reference Platform (CHRP) that would run all PowerPC software, other companies would quickly jump in with 100-percent-compatible PowerPC machines even cheaper than those from Apple and IBM.

Although that common platform isn't yet a reality, the idea was that someday the ties between proprietary hardware and software would be largely severed; you'd be able to run Apple's Macintosh System and Finder (and all of the accompanying applications) on an IBM PowerPC machine, and IBM's OS/2 (and all of that machine's applications) on an Apple Macintosh. When Motorola announced that it was working on a port of Microsoft's new Windows NT to the Power-

PC world, buyers' wish lists seemed complete.

What more could a power-hungry computer user, or a price/performance-sensitive corporate PC buyer, want? It was going to be a win/win situation all around, except, of course, for poor Intel, whose decade-plus dominance with x86 chips would quickly end.

APPLE'S GAME?

Now, 48 months later, a funny thing has happened: Intel's x86 design, beneath the 486 and Pentium banners and with the P6 just around the corner, is more dominant than ever.

Somerset Design Center—the Austin design shop assembled by Apple, IBM,

ogy's Elastic Reality Windows NT for PowerPC 1.0, Microsoft Excel 5.0, Microsoft Word 6.0, and North Coast Software's PhotoMorph NT.

Fourth claim: The x86 architecture is running out of headroom. Proponents of RISC have been waving this doom-and-gloom banner for years, but the fact is that x86 CPUs have progressed almost exactly as predicted by Moore's Law: They double in performance approximately every 18 months, although this is not the case with the P6 for mainstream applications. Sure, the x86 architecture has its problems—instruction encoding is notoriously convoluted, and absurdly few registers are provided—but designs such as AMD's K5 processor and Intel's forthcoming P6 chip address many of these issues by shrouding a RISC-like CPU core with an on-the-fly x86 instruction translator.

Ultimately, the x86 architecture may indeed hit the wall. But Intel appears to be prepared for that contingency, having aligned with Hewlett-Packard Co. (which makes the PA-RISC processor used in HP's engineering workstations) to build what is presumably some kind of hybrid chip that supports a new instruction set but remains compatible with legacy x86 code.

THE BOTTOM LINE

The PowerPC entered the scene with a lot of promise and the backing of three

major players. This is certainly the RISC processor that has the greatest chance for breaking out of the workstation market and into the mainstream. But as Intel continues to ratchet the performance of its CPUs up and drive prices down, the PowerPC will be hard-pressed to compete. A limited selection of native software and operating systems narrows the potential market further.

The PowerPC's prospects are positive in the Macintosh and Mac-clone markets, which are readily abandoning the aged Motorola 68000 series of CPUs. The key for the Mac-clone and the Windows NT-based PowerPC markets will be the effort that software developers are willing to put into not just porting their applications but porting them *well*, ensuring that they do run faster or offer more features than those on the x86 platform.

Pros and Cons of the Platforms

The PowerPC holds plenty of promise, but can it deliver? Pentium PCs offer many of the same advantages today, with little risk. The biggest challenge for the PowerPC will be offering enough momentum to entice software developers—the same problem that has plagued most RISC chips.

PowerPC-based PCs		Pentium-based PCs	
Pros	• The new architecture avoids the limitations of the dated x86 instruction set. Systems run much x86 software with the help of emulators built into operating systems. • Chips are less expensive to manufacture than x86 processors of comparable performance. • A highly successful debut in Apple's Power Macintosh line has built interest.		• Systems run all existing x86 software at full speed on a variety of mainstream operating systems. • Systems are available from hundreds of vendors; competition promotes low cost. • Historically, performance increases and price decreases have been consistent.
Cons	• The selection of native software is limited; emulated software runs slowly. • Systems require Windows NT or Unix (they can't run Windows 3.1 or Windows 95, and OS/2 for PowerPC is not yet ready). • Systems are available from a limited number of vendors and are relatively expensive. • Low volume means that software developers are less inclined to optimize code, negating any performance advantage intrinsic to the hardware.		• The growth path of a 15-year-old architecture may be limited. • Systems can't run the Macintosh operating system. • The increasing variety of system and software suppliers has led to compatibility and setup concerns.

and Motorola—did its job well; several PowerPC chip designs have now been delivered in quantity. The first design, the PowerPC 601 (admittedly a reworked version of an existing IBM RISC chip) was delivered in record time, and it helped Apple get the Power Macintosh line off the ground. The PowerPC 603, 603e, and 604 followed, and will soon be joined by the 602, 620, and 630.

Yet in spite of the variety of PowerPC processors available today, it has been hard indeed to find a PowerPC-based computer other than Apple's Power Macs actually for sale. Apple embarrassed IBM by bringing PowerPC machines to market a year ahead of Big Blue. Though versions of Apple's hot PowerBooks using PowerPC chips are just now arriving, Apple has done a good job of shifting the majority of its desktop line away from the aging Motorola 68000-series processors to the PowerPC family.

The move has bought Apple time, though the company continues to lose share in the PC market as a whole. Apple remains very strong in the education and graphics/publishing markets,

and its early, aggressive adoption of PowerPC chips will probably help it maintain its share in those areas.

So what happened to IBM, the biggest, most visible, and most important partner in the PowerPC triumvirate? Where are

Over a year after Apple, IBM is finally shipping PowerPCs systems.

its machines? And where are all those fast, cheap PowerPC clones?

LATE TO THE PARTY

IBM blew its chance for early market leadership in the PowerPC universe through internal bickering and also through its remarkably persistent confusion over whether its future lies in PC hardware or PC operating systems.

Though Nobuo Mii, the brilliant and charismatic general manager of IBM's Power Personal Systems division, reportedly had designs ready for production in the fall of 1994, IBM's Personal Software

Products division didn't have OS/2 for the PowerPC chip ready yet. AIX, IBM's well-established Unix variant, was available, of course—and running fine on IBM's PowerPC-based RS/6000 servers and workstations, introduced in 1993. But AIX's suitability for workstations doesn't make it an equally good choice for running general-purpose business-productivity applications. In IBM's scheme, that was the role of OS/2.

IBM's honor was at stake, IBM software managers argued: PowerPC boxes couldn't come to market without OS/2 on them. The only alternative non-Unix operating system was (shudder) Windows NT, from the dreaded Microsoft. Surely IBM wouldn't bring its heralded new computers to market running only a Microsoft operating system. Besides, they reasoned, it would be only a couple of months before OS/2 for the PowerPC was ready.

A year later, OS/2 for the PowerPC still hasn't materialized. A chastened IBM, under pressure from the top to get PowerPC designs to market before they went stone-cold, finally showed its new desktop and notebook PowerPC systems at PC

Apple Narrows the Gap: Is It Enough?

By Anush Yeghazarian

Despite its considerable success, Apple had long labored under the perception that its systems were both too slow and too expensive to compete on price/performance terms with x86-based PCs. The PowerPC-based Power Macintosh family has changed the equation dramatically, providing unprecedented bang for the buck while retaining Apple's trend-setting user interface and relatively hassle-free operation. And now that Power Macs with PCI support are here, the differences between Macintosh and PC hardware are narrowing even more.

A high-end Power Macintosh will still cost you about 35 percent more than a comparably configured Pentium PC. (That margin might shrink as Apple clones reach higher volumes.) More significant, our performance tests lead us to believe that the Power Mac can

largely hold its own in terms of performance—although Microsoft's intensive optimization of Microsoft Office applications for x86 PCs did leave the Power Mac in the dust on our Microsoft Excel and Microsoft Word tests.

THE COMPETITION: WINDOWS 95

As the hardware gap closes between the Mac and the PC, differences in software user interfaces and operating systems may well matter more than differences in hardware. Will the advent of Microsoft Windows 95 kill Apple's System 7.5? Not likely. To be fair, Windows 95's technical innovations and new interface have irrevocably erased the idea that Windows is just a clunky Mac OS knockoff. And in some ways Windows 95 is clearly ahead of System 7.5; it supports preemptive multitasking, for example, which the Mac won't have until Sys-

tem 8 (code-named Copeland) debuts in mid-1996.

In terms of hardware compatibility, however, the two are nearly matched: Windows 95 offers full Plug and Play support to make adding or removing compliant peripherals a snap, while the Apple platform has always offered an easy upgrade path because of Apple's control over its hardware standards. (Apple's new hardware licensing agreements should not have a significant impact in this area for a while, since Apple keeps a fairly close eye on its licensees; licensing has also alleviated IS worries about a single source for hardware.)

The two operating systems also offer a comparable assortment of features, though each has certain strengths. For example, Windows 95 has a greater variety of network protocols and drivers. It also provides some

Expo in New York this past June—running Windows NT. OS/2 for the PowerPC in a Warp Connect version is now due sometime this winter.

READY FOR PRIME TIME?

With that ragged history in mind, we approached this evaluation with a number of questions: Are PowerPC computers really ready for prime time? Do they offer the big performance gains promised? Are they bargains? And finally—perhaps most critically—what about software for them? In summary, do PowerPC machines offer the compelling advantages over x86-based systems that we were led to expect?

Windows NT is an extremely good operating system and is currently enjoying a vogue among corporate PC managers and power users. Many of these users have decided to pass up the Microsoft Windows 95 bandwagon and go for the power, security, and relative maturity of Windows NT, even though its user interface is dated. But people don't buy a business computer to run an operating system; they buy one to run applications. Windows NT running on Intel processors

can handle most DOS, Windows 3.1, and Windows 95 applications just fine, but what's available for PowerPC machines running Windows NT?

That question, at least, is easy to answer, though the answer is discouraging: very little. There's Microsoft Excel and

Pentium systems reap dramatic performance benefits because of software optimization.

Microsoft Word, plus a handful of specialized image-editing applications: Adobe Photoshop, Avid Technology's Elastic Reality, Deneba's Canvas, and North Coast Software's PhotoMorph. End of list, for now. (On the Mac side, most software publishers have long since moved their products to Apple's PowerPC Power Mac machines; however, those apps won't run on the PC arena's PowerPC boxes.)

Sure, you can run many other existing

x86 applications through the software-emulation capabilities that are built into Windows NT for the PowerPC, but why pay upwards of \$5,000 for (at best) 486-class performance and the risk of incompatibilities?

On that count alone, we'd avoid buying a PowerPC computer today. The plethora of applications that run fine under Windows 3.1, Microsoft Windows for Workgroups, and Windows 95—and often, now, under Windows NT as well—on Intel x86-based hardware can meet nearly any user's needs. More Windows NT/PowerPC apps will be along this fall and next year, but why play applications roulette?

Why, particularly, when these PowerPC machines we tested cost more than similar designs using Intel Pentium CPUs—and often can't even match the performance of the Pentium boxes?

PRICE/PERFORMANCE MEASURES

Even PowerPC vendors acknowledge that the idea of PowerPC machines undercutting Intel PC pricing is hopeless, at least for now. A similarly configured Pentium-equipped PC costs from 35 to 50 percent less than a PowerPC box. (The Power Mac-

basic software for you to use your TCP/IP support to get on the Internet (Macs come with Mac/IP support but no software). Windows 95 is also the only non-Unix operating system that can process NetWare login scripts. It is ready to set up workgroups; offers several layers of security for shared files, drives, or printers; and makes exploring your network as easy as exploring your computer.

System 7.5 has its share of attractions as well, tending more toward ease of use. Apple's PowerTalk goes one step beyond Microsoft's Inbox to offer you a one-stop shop for faxes, voice mail, and *all* of your e-mail (no matter which software account you have—gateways currently exist to CompuServe, Microsoft Mail, the Internet, and others, with more in the works). PowerTalk also offers a "keychain" to users who are tired of remembering multiple passwords for servers, mail systems, and the like. PowerTalk stores

the passwords on your hard disk and provides access to all of your accounts through one master password encrypted on your hard disk, which should reassure nervous network administrators. A downside to System 7.5 is that you'll need PowerShare, an add-on with a \$999 list price, to bring PowerTalk's features to a large workgroup environment.

Apple plays to its strength with its help program, Apple Guide. Guide goes one step beyond Microsoft's Help by not only *telling* you how to perform certain functions but *showing* you. Guide will hold your hand each step of the way—directing you to menus and commands, circling the proper choices, and monitoring your actions to be sure you've performed each step correctly before moving on to the next one.

WHAT ABOUT WINDOWS NT?

If you're sold on the PowerPC concept but are undecided between an

x86 PC and a Mac, your decision won't be between the Mac OS and Windows 95—Windows 95 won't run on the PowerPC. Instead, your primary alternative will be Microsoft Windows NT. (OS/2 for the PowerPC will be available early next year.) Windows NT has numerous strengths, including C2-level security and sophisticated tools for network administration. But its dated Windows 3.1 look and feel pale in comparison with both Windows 95 and System 7.5.

If performance is what matters to you, the decision between the Power Mac and the PowerPC plus Windows NT hinges on the type of application you'll be running. For Microsoft's office-automation apps, the answer is clear: The Windows NT machines blew the doors off the Power Mac. But on certain of our image-editing tests, the Mac proved superior. The moral: Try before you buy.

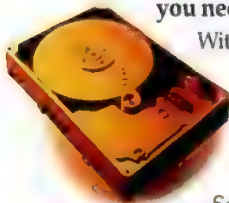


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*Source: PC Magazine, May 16, 1995

**WinBench 95, version 1.0, Disk WinMark result on representative PC platform.

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intosh we tested sells for \$9,400, the IBM PowerPC system costs \$9,392, and the Motorola PowerPC system—which you'd find difficult to buy outright in the first place—is priced at \$6,499. Tangent's MediaStar 5133, comparably configured for our tests, is priced at \$5,295.)

Part of the problem is that right now the 133-MHz PowerPC 604 processor actually sells for a slightly higher price than the 133-MHz Pentium. But the bigger culprit is lack of volume—and volume is the primary factor in PC-hardware pricing. Perhaps, with greater volume production, PowerPC computers will fall to more competitive price levels. But even if we include Macintosh and Mac clones, we con-

sider it unlikely that PowerPC systems' volume will approach—let alone exceed—that of x86 systems anytime in the future.

Intel can also influence the pricing game: With fat margins and a history of aggressiveness when its turf is challenged, Intel can and will trim x86 CPU prices as necessary to keep tipping the scales against PowerPC chips.

The Apple/IBM/Motorola consortium's claims for the raw performance of PowerPC machines are even more controversial than the group's pricing trends. The PowerPC group has consistently published performance ratings for PowerPC chips that show them to be

about twice as fast as the Intel chips against which they're measured. But ratings based on the SPECmark92 benchmark tests, which comprise SPECint92 and SPECfp92, show a much closer correspondence between the two lines. For example, a 100-MHz PowerPC 603e machine earns a SPECint92 rating of 120 and a SPECfp92 score of 105, while the comparable 100-MHz Pentium system comes in with a SPECint92 score of 100 and a SPECfp92 result of 80. The tested IBM and Motorola machines equipped with 133-MHz PowerPC 604 chips posted scores of 200 on both SPECint92 and SPECfp92, while the 133-MHz Pentium system, their closest competitor,

The PowerPC Family Tree

By John Clyman

It seems as though there are as many variations on the PowerPC processor as there once were on the 486, and more are arriving all the time. The various processors make distinctly different trade-offs among performance, power consumption, and price to meet the demands of their various target markets. (See the table below.)

The original PowerPC 601 processor, introduced in 1993, is fading and has been eclipsed by the PowerPC 604, which runs at higher clock rates and can process more instructions per clock cycle. This performance requires a considerable amount of power, however: The 133-MHz PowerPC 604 typically draws a rather

hefty 18 watts. That makes it unappealing for portable applications, because it creates hard-to-dissipate heat and places heavy demands on batteries.

The PowerPC consortium (which comprises Apple, IBM, and Motorola) originally designed the PowerPC 603 to fill the notebook and energy-efficient desktop niches; a faster but equally cool-running version of that CPU, the PowerPC 603e, is used in IBM's ThinkPad 800 series of PowerPC-based notebooks. The PowerPC group is also working on a low-power PowerPC 602 CPU (not yet released), which should be extremely inexpensive because of its diminutive size but will sacrifice top performance as a result.

Scaling up the performance ladder from the PowerPC 604 is the PowerPC 620, the only 64-bit PowerPC CPU yet announced. With most of the PC world only now making the transition from 16-bit to 32-bit code, however, it's not clear that the ability to run 64-bit code will provide an immediate benefit to most users. The PowerPC 620 will remain backward-compatible with 32-bit PowerPC code.

The consortium has also hinted at a PowerPC 630 chip that will succeed the PowerPC 620, but will not yet disclose details about the chip's architecture except to indicate that it will roughly double the performance of the PowerPC 620. The PowerPC 630 is due in 1997.

Processor	Ship date	Clock speeds (MHz)	Supply voltage	Register size	Data bus width	Address bus width (and maximum addressable physical memory)	Maximum instructions per clock cycle	Die size ¹	Number of transistors	Typical power dissipation ¹
PowerPC 601	September 1993	50–100	3.6V	32 bits	64 bits	32 bits (4GB)	3	11 mm x 11 mm	2.8 million	4W
PowerPC 602	To be announced	66	3.3V	32 bits	64 bits	32 bits (4GB)	2	7.0 mm x 7.0 mm	1 million	3W
PowerPC 603	June 1994	66, 80	3.3V	32 bits	32 or 64 bits	32 bits (4GB)	3	7.4 mm x 11.5 mm	1.6 million	3W
PowerPC 603e	May 1995	100, 166	2.5V	32 bits	32 or 64 bits	32 bits (4GB)	3	8.4 mm x 11.7 mm	2.6 million	3W
PowerPC 604	June 1995	100–133	3.3V	32 bits	64 bits	32 bits (4GB)	4	12.4 mm x 15.8 mm	3.6 million	18W
PowerPC 620	To be announced	133	3.3V	64 bits	128 bits	40 bits (1,024GB)	4	17.1 mm x 18.2 mm	7 million	30W
Pentium	March 1993	60–133	2.9V–5V	32 bits	64 bits	32 bits (4GB)	2	9.2 mm x 9.9 mm	3.3 million	4W
P6	Fall 1995 (projected)	133, 150	2.9V	32 bits	64 bits	36 bits (64GB)	Varies	17.5 mm x 17.5 mm ²	5.5 million ²	Info not available

¹ Specs are quoted for the version with the highest clock speed

² This figure does not include the separate L2 cache chip, which contains another 15.5 million transistors (for 256K cache) or 31 million transistors (for 512K cache)

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Performance Tests: PowerPCs

Test results were mixed: In some cases, the PowerPC systems easily outran the Pentium configurations; in others, the reverse was true. We attribute the uneven results to differing levels of software optimization as much as to variations in the hardware.

What the Numbers Mean

We cannot state categorically that the 133-MHz PowerPC 604 processor is or is not any faster than a 133-MHz Pentium CPU. If our tests demonstrate anything conclusively, it's that overall system performance can be dramatically affected by the characteristics of individual applications, which means generalizations are next to impossible. We did find that the Pentium systems significantly outperformed their PowerPC counterparts when running Microsoft's office-automation applications. But Microsoft acknowledges its applications are highly optimized for the x86 family. The other programs we

P/133 = Pentium/133 PP/133 = PPC604/133 S7 = Macintosh System 7
NT = Microsoft Windows NT 95 = Microsoft Windows 95

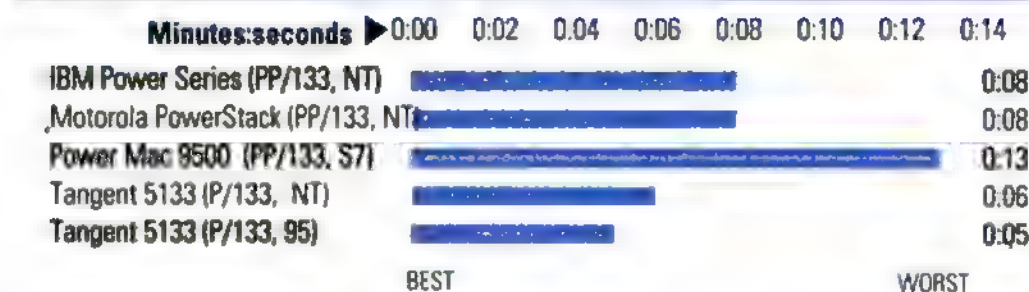
SCRIPTED WORD



SCRIPTED EXCEL



EXCEL FILE OPEN



achieved results of 155 on SPECint92 and 116 on SPECfp92.

Furthermore, the SPEC benchmark tests, which are based on tiny synthetic "applications" that are highly subject to optimization, are not generally considered to be predictive of performance when running real applications.

When we tested the PowerPC systems

against a Pentium machine using actual shrink-wrapped apps, the results were even more mixed.

BY THE NUMBERS...

When running typical office-productivity applications, for example, the PowerPC machines couldn't deliver even that modest improvement over typical Pen-

tested generally ran somewhat faster on one or more of the PowerPC units than on the Pentium PCs.

Performance seems to depend largely upon the types of applications you choose. If you are working on graphics-intensive tasks, the Power Macintosh 9500 appears to offer the best performance. And PowerPC units running Windows NT have an edge over Pentiums for non-Microsoft applications. (But remember that very few native PowerPC applications have yet been written for Windows NT.) When running Microsoft Word and Excel office-automation software, the Pentium PCs were clear winners. As software and compiler technologies evolve on the different platforms, however, these patterns may well change.

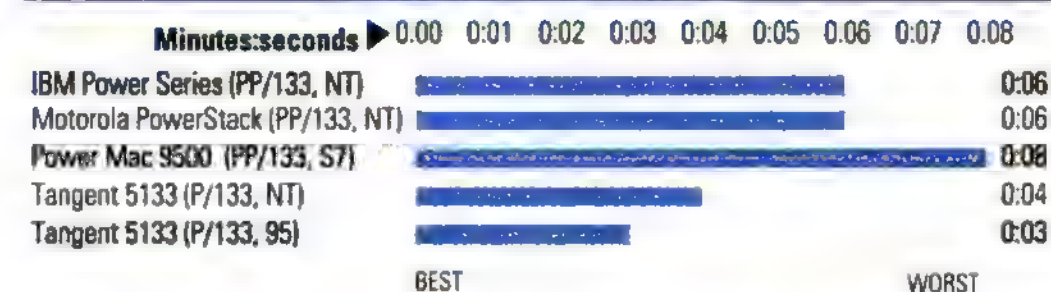
In general, the PowerPC systems also handled floating-point calculations substantially faster than our Intel-based system. Since few mainstream applications rely heavily on floating-point calculations, this advantage will be of interest primarily to users of high-end CAD and graphics packages and the like.

OFFICE-AUTOMATION TASKS

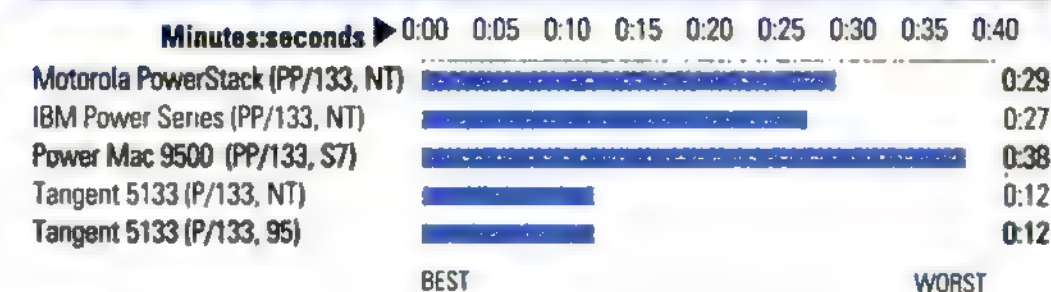
On the tests based on Word and Excel, the Pentium machine running Windows NT consistently shaved at least 25 percent off the timings of the PowerPC systems running Windows NT, and it more than doubled the performance of the Power Macintosh. The performance differential was consistent both on the Scripted Word and Scripted Excel tests, which tend to exercise the CPU and memory, and on the Excel File Open and Excel File Save tests, which emphasize disk I/O.

On the Excel Math and Memory Stress test, the Pentium PC under both Windows NT and Windows 95 opened the gap even further. It was more than twice as fast as the PowerPC

EXCEL FILE SAVE



EXCEL MATH AND MEMORY STRESS



tium performance we saw with the publicly available SPECmark92 benchmark tests. When we stacked up the Pentium-based MediaStar 5133 against the PowerPC machines running the same apps—all under Windows NT Workstation 3.51—we found that our two productivity apps, Excel and Word, ran somewhat faster to much faster on the Pentium box.

systems running Windows NT, and more than three times as fast as the Power Macintosh. On the Word Spell-Check test, the PowerPC systems running Windows NT took about 20 seconds and the Power Macintosh took over a minute, while the Pentium configurations each took less than a second.

We couldn't believe that a difference of this magnitude could be explained by hardware alone, and a discussion with Microsoft engineers confirmed our suspicion: Microsoft has made much greater efforts to optimize performance on the x86 platform (which accounts for the bulk of its sales) relative to the PowerPC versions. In fact, the spell-checking function operates in a qualitatively different manner on Pentium systems than it does on the others: It spell-checks words in the background before the spell-checker is invoked by the user, masking the true time required to perform the dictionary lookups.

The fact that optimization affects performance doesn't invalidate our tests; buyers of PowerPC machines will face the same situation. It merely emphasizes that overall system performance depends on both hardware *and* software.

The IBM PowerPC system tended to outperform the Motorola PowerPC machine by a few seconds on most tests, which could be a consequence of a slightly faster memory, graphics, or disk subsystem; our tests are not sufficiently granular to determine which. The Pentium PC running Windows NT similarly edged out the same machine running Windows 95 on the Scripted Excel and Scripted Word tests, which points to a difference in the overhead imposed by the operating system.

GRAPHICS APPLICATION TESTS

The Power Macintosh has traditionally been a powerful player in the desktop publishing and high-end graphics industry, and

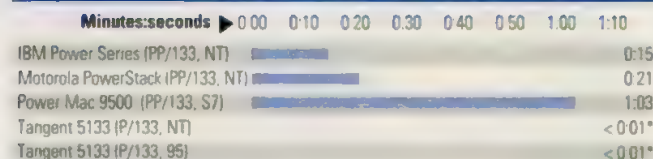
our tests largely affirmed its advantage in that arena. For example, the Power Macintosh applied a gradient fill to an image in Deneba's Canvas roughly twice as fast as any other system—including the PowerPC units running Windows NT. But those PowerPC systems turned in some impressive results too: On the Elastic Reality Morph test, which stresses floating-point performance, they shaved roughly one-third off the timings achieved by the Pentium configurations and by the Power Macintosh.

We also conducted tests using Adobe Photoshop and North Coast Software's PhotoMorph. (Note that Photoshop is not available for Windows NT on the PowerPC and that PhotoMorph is not available for the Power Macintosh.) The PhotoMorph Morph test, which is similar to the Elastic Reality Morph test but emphasizes integer rather than floating-point performance, again showed a significant advantage for the PowerPC machines running Windows NT: the Pentium configurations took from 25 to 55 percent longer.

The PhotoMorph Disk I/O test expands the size of the morphing test so that it exceeds available memory, causing intensive disk activity. Again, the Windows NT-based PowerPC units came out well ahead of the Pentium PCs.

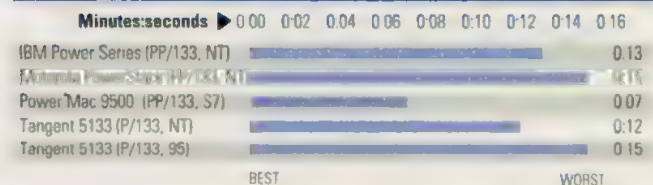
On the Photoshop Sharpen Edges test, the Pentium configurations and the Power Macintosh ran neck and neck. The difference was more dramatic on the Photoshop Gaussian Blur test, where the Pentium system running Windows NT took only two-thirds as long as the Power Macintosh—and half as long as the Pentium system running Windows 95 (with *exactly* the same application software). We were unable to determine why Photoshop's performance degraded under Windows 95 and can only hypothesize that it arose because of disk processing overhead or some section of 16-bit code that caused a bottleneck.

WORD SPELL-CHECK



* On Intel-based units, Word automatically spell-checks in the background, artificially improving test scores

CANVAS GRADIENT FILL



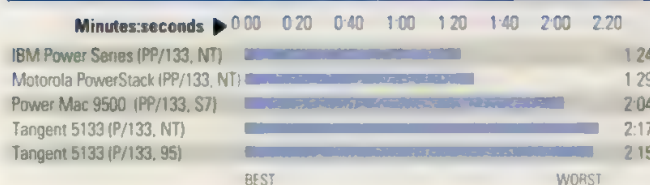
Our Scripted Word test, for example, completed in 29 seconds on the MediaStar 5133 but took 42 seconds on the IBM Power Series 850, 45 seconds on the Motorola PowerStack, and a whopping 2 minutes 16 seconds on the Power Mac 9500.

Our Scripted Excel test ran in 34 seconds on the MediaStar 5133 under Windows NT but took 46 and 47 seconds on

the IBM and Motorola machines, respectively, and 2 minutes 14 seconds on the Power Mac 9500.

Not very encouraging, especially given the Pentium machine's price advantage over the competition. (Note that differences in hardware, particularly the size of the monitor, account for some but not nearly all of the price differential.)

ELASTIC REALITY MORPH



PHOTOMORPH MORPH



N/A—Not applicable. PhotoMorph is not available for the Power Macintosh

The news gets worse. Our Word Spell-Check test ran so fast on the MediaStar 5133 that it was literally too quick to measure because of background operation. On the IBM Power Series 850, the Spell-Check test took 15 seconds; on the Motorola PowerStack it took 20 seconds, and on the Power Mac 9500 it took an endless 1 minute 3 seconds.

The Photoshop Lighting Effect test also gauged the relative floating-point performance of the systems, and in this case the Power Macintosh emerged as a clear leader. On this test as well, the Pentium unit running Windows NT substantially outperformed the same machine running Windows 95.

—Analysis written by Daniel Grotta, Sally Wiener Grotta, and Charles Rodriguez

How We Tested

Because no widely accepted multiplatform, application-based benchmark test suite exists, we constructed a series of application-based tests specifically for this roundup. The applications we chose were all 32-bit versions native to the platforms we tested them on, which included Windows NT on the PowerPCs, Windows NT and Windows 95 on the x86 system, and Macintosh System 7.5.2 on the Power Macintosh. We sought applications available on at least three of these platforms and ended up with Adobe Photoshop 3.0, Deneba's Canvas, Avid Technology's Elastic Reality, Microsoft Excel 5.0, Microsoft Word 6.0, and North Coast Software's PhotoMorph. Canvas, Elastic Reality, and PhotoMorph were all in beta releases for the PowerPC. Furthermore, Photoshop is not currently available for the PowerPC systems running Windows NT, and PhotoMorph is not available for the Power Macintosh.

In all cases, we tested each machine by timing how long it took to complete several different real-world tasks within the selected test applications. In some cases we used a stopwatch, in others a self-timed macro-driven test script. We ran all tests multiple times to reproduce and verify results.

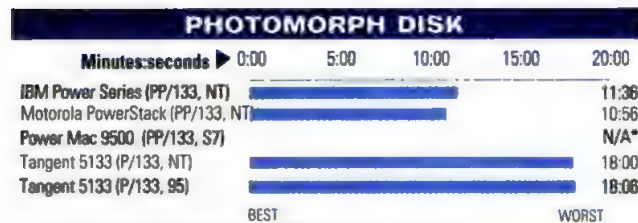
Other than changing the amount of memory and removing nonessential device drivers, we tested the system as configured by the manufacturer. (We initially conducted tests with 32MB as well as 64MB, but because the large footprint of Windows NT and our test applications caused an excessive amount of disk swapping, we have not printed those results.)

The **Scripted Word** test performs 12 commonly used functions—formatting, font changes, print previews, graphics insertions, search-and-replace operations, and so forth—on a 23-page document. This test stresses complete system functions (except for floating-point operations). The **Scripted Excel** test spans a wide range of functions, including worksheet calculations, graphics, and file I/O. Both of these scripted tests exercise a range of functions similar to those comprising our Winstone 95 test suite.

The **Excel File Open** and **Excel File Save** tests measure the time taken to load and save a 2MB Excel spreadsheet. The **Excel Math and Memory Stress** test isolates the performance of the CPU and memory subsystems in a machine. It is based on an extremely large Excel worksheet that uses all 16,384 rows of the spreadsheet across multiple columns to perform millions of interlinked math operations (both integer and floating-point). The **Word Spell-Check** test executes a spell-check in Word on a 77-page document with no spelling errors. This test stresses integer and memory operations.

The **Canvas Gradient Fill** test fills 39 circles with 144 hues that progress from red to blue. This test exercises a CPU's integer math capabilities and memory. The **Elastic Reality Morph** test morphs two images together through a sequence of 30 intervening frames, which stresses the CPU's floating-point capabilities and the machine's memory subsystem. The **PhotoMorph Morph** test performs a similar morph through 200 intervening frames. In this case, however, the test exercises primarily integer and disk functions. The **PhotoMorph Disk I/O** test performs a morphing effect with 999 intervening frames and Video 1 compression enabled; this test generates so much data that physical RAM is exhausted and extensive disk activity is caused as the virtual memory manager swaps data to disk.

The **Photoshop Sharpen Edges** and **Photoshop Gaussian Blur** tests perform common image-editing functions on a 15MB TIFF file, stressing CPU integer capabilities and the memory subsystem. The **Photoshop Lighting Effect** test uses an 18.5MB TIFF file and exercises floating-point capabilities.



N/A*—Not applicable. PhotoMorph is not available for the Power Macintosh



N/A**—Not applicable. Photoshop is not available for PowerPC machines running Microsoft Windows NT



N/A**—Not applicable. Photoshop is not available for PowerPC machines running Microsoft Windows NT.



N/A**—Not applicable. Photoshop is not available for PowerPC machines running Microsoft Windows NT.

There's a reason for these vast discrepancies, and it involves more than the hardware alone. The extent to which applications have been optimized for a given platform makes a big difference in the outcome of application-based testing. Put simply: If you want to use productivity apps from Microsoft, such as those in Microsoft Office (which have been

extensively tweaked for x86 execution), you should stay away from PowerPC machines, at least for now. On the other hand, the mix of integer and floating-point operations within an application also has an impact on performance. And if you want to run graphical applications, such as CAD and image-editing packages, you may find PowerPC boxes

worthwhile—if the package you want is available for the Power PC running Windows NT. (For a more detailed description of the test results and optimization issues, see "What the Numbers Mean.")

Execution times for procedures in the image-editing programs we used for comparison made the PowerPC's advantage

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clear. In these high-end graphics programs, which make extensive use of floating-point math for certain types of effects and thus should benefit from the PowerPC chips' superior floating-point performance, we saw differences that made the PowerPC look much better. But again, it's not just number-crunching; it's *how* you crunch the numbers.

The PowerPC machines performed about twice as fast on our integer-intensive Canvas Gradient Fill test as the Pentium system. The Elastic Reality Morph test, for example, ran markedly faster on the two Windows NT systems than on either the Power Macintosh or the Pentium system.

To make things even more confusing, we found an anomalous situation with PhotoMorph, an application that uses integer math instead of floating-point calculations for many functions: It ran much faster on the PowerPC machines than on the Pentium. These tests underscored for us the illusion of exact comparability in cross-platform applications testing.

...BUT WHICH NUMBERS?

Fair and realistic though these tests are—unless you write your own applications, you're limited to running what you can buy among commercially available, off-

the-shelf applications and working with whatever performance you can get with those apps—they are also not so directly comparable as they may seem at first.

The problem is that applications by the same name but running on different hardware can be very different beasts indeed. Even though applications may share some (but never all) of the same code, the extent to which an application has been tweaked for a given operating system/hardware platform dramatically affects its performance. For example, despite their dominance of the Macintosh word processing and spreadsheet markets, Microsoft's Excel and Word are not nearly so finely tuned on the Mac (both older 680x0 Macs and the new Power Macs, including the Power Mac 9500 on our tests) as they are on x86 PCs running Windows.

Thus, even when same-name applications—such as Canvas—are available for all the machines on our tests, differences in observed performance may be attributable at least as much to variations in the software as to relative hardware merits.

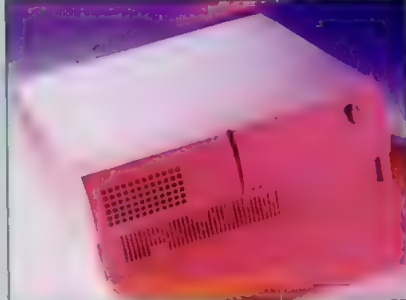
We—and you—have little choice in this matter. Again, we can only run those apps that are available, and if the versions of the applications we found are more highly evolved in the vastly larger and more profitable x86/Windows market than in the PowerPC/Windows NT and Power Mac/System 7.5.2 arenas, the differences shown in our comparisons are very real.

Application-independent measures, such as the SPECmark92 benchmark tests, are thus also useful, since they separate raw hardware performance from combined software-and-hardware performance. But except for programmers doing development work on PowerPC platforms, SPECmark92 benchmark tests don't bring much real-world price/performance information to a purchasing decision.

Finally, for those who may wonder how the x86 versions of these apps perform under Windows 95, we repeated our tests on Tangent's MediaStar 5133 with the shipping version of Windows 95 installed in place of Windows NT. Our Excel and Word macros took a couple of seconds longer under Windows 95 than they had under Windows NT. Most of the

▶ **FACT FILE**

IBM Power Series 850



Estimated street price: \$9,392 **Processor/memory:** 133-MHz PowerPC 604, 64MB RAM, 512K external cache **Data storage:** 1GB IDE hard disk, IBM quad-speed IDE CD-ROM drive **Display:** X-10 Graphics Adapter 4096, IBM Sight and Sound 17-inch monitor. **Software:** Microsoft Windows NT 3.51 **In short:** IBM's PowerPC system outperformed a Pentium machine on graphics-intensive tasks, but it is substantially more expensive and is restricted to a handful of native software titles. For about the same price, the Power Macintosh is equally speedy yet more flexible

IBM Corp., 800-772-2227; fax, 800-426-4329

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graphics-intensive tests also took a bit longer under Windows 95.

FIT AND FINISH

We'd be remiss if we didn't mention that we found other worrisome problems with the PowerPC machines running Windows NT in the course of our testing. For example, both demanded enormous amounts of RAM for acceptable performance—even beyond Windows NT's usual sizable appetite for memory. We settled on 64MB of RAM as our standard for testing; we found that 32MB just didn't provide enough room for both Windows NT and even one application, especially a memory-hungry graphics app. With 32MB installed in the PowerPC machines, performance was substantially and sometimes hopelessly slower, as the machines paged data out to disk constantly. For instance, on the Canvas Rotation test (not charted), the Motorola PowerStack took 9 seconds to complete the move with 64MB of RAM, compared with 30 seconds for a 32MB configuration.

To be sure, adding more RAM is almost always a prescription for better performance under any version of Windows, and we've seen heavy memory demands

▶ **FACT FILE**

Apple Power Mac 9500



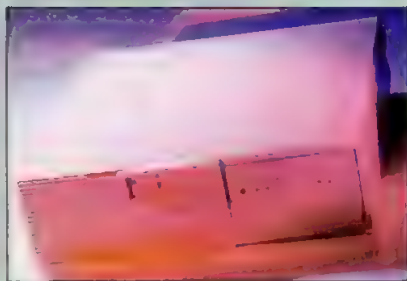
Estimated street price: \$9,400 **Processor/memory:** 132-MHz PowerPC 604, 64MB RAM, 512K external cache **Data storage:** 2GB Fast SCSI-2 hard disk, Sony quad-speed SCSI CD-ROM drive **Display:** ATI XClaim GA 4096, Apple Multiple Scan 20 Display 20-inch monitor **Software:** Macintosh System 7.5.2 with Apple Guide, Apple Script, PC Exchange. **In short:** Apple's high-end Power Macintosh was sometimes faster and sometimes slower than our Pentium comparison system. For about the same price as the IBM and Motorola PowerPC systems that run Microsoft Windows NT, the Power Mac offers far more choices of native software.

Apple Computer Inc., 800-776-2333, fax, 408-996-0275.

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► FACT FILE

Motorola PowerStack DT604-133NTW



Estimated street price: \$6,499 **Processor/memory:** 133-MHz PowerPC 604, 64 MB RAM, 512K external cache **Data storage:** 1GB Fast SCSI-2 hard disk, Toshiba quad-speed SCSI CD-ROM drive **Display:** Diamond Viper Pro 4096, Panasonic TX-D1751NM 17-inch monitor. **Software:** Microsoft Windows NT 3.51 **In short:** The Motorola PowerPC performed well on graphics applications but fell behind the Pentium under Microsoft Office. It's competitive with the Power Macintosh in terms of its price/performance but has a far more limited selection of native software titles.

Motorola Computer Group,
800-759-1107; fax, 602-438-4636
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in Windows NT machines before. But PowerPC chips up the ante even further, easily doubling the minimum effective RAM level (and requiring four times what you'd find in a typical desktop running Windows 3.1 or Windows 95). At \$40 or so per megabyte, this additional memory is largely why the machines are so expensive to begin with.

The PowerPC systems were also flakier than typical x86 machines we've had in PC Labs over the past couple of years. They locked up unexpectedly, lost mouse control, and demonstrated other problems more typical of preproduction designs than of stable, ready-to-go-to-work production units. We couldn't isolate these problems to defective components, and the problems weren't always neatly reproducible, but the bottom line is clear: PowerPC machines are still undergoing teething pains, and you can't expect them to work flawlessly.

Similar problems aren't exactly unheard of among PCs, of course—buggy graphics drivers being perhaps the most notorious culprits in the x86/Windows world—but based on our experience with these two test machines, buyers of this generation of PowerPC boxes may expe-

rience continual problems that defy easy resolution.

A TOUGH ROAD AHEAD

If current PowerPC computers are flaky, have little available software, cost more, and don't perform as well as (or do perform only somewhat better than) widely available Pentium machines, what's the future for the PowerPC?

It looks tough. But not hopeless. Though they're very late to market and not yet particularly competitive, PowerPC designs may still grab market share from Intel-based machines. In June, IBM showed some remarkable new PowerPC machines at PC Expo. This group included both desktops and portables; the latter, using the 603e chip, were especially impressive. Some notebook models even had built-in video cameras to support videoconferencing. Users should be able to videoconference over even ordinary POTS (plain old telephone service) lines, IBM says—though of course higher-speed ISDN and T1 connections will translate into better quality and larger, less jerky images.

IBM also showed some amazing new software running on these announced but undelivered new PowerPC systems. IBM says its new "sensory suite" software will eliminate the need for add-on hardware devices for such functions as speech recognition, high-quality audio, and full-motion video. Speech-to-text dictation using Big Blue's superb Voice-Type technology should allow business professionals to dictate directly into their notebook computers—though it will still require the patience of word-at-a-time discrete speech. IBM also promises a high-performance software MPEG decoder that can be used to display audio/video files.

IBM also says it will deliver the first iteration of its intelligent-agent "human-centered experience" software on these PowerPC machines. And it promises a free CD of other goodies, including live whiteboard conferencing, to buyers. The IBM PowerPC notebooks, which will sell under the ThinkPad 800 series moniker, are due this fall.

Other vendors are working on hot new PowerPC systems, too. We reviewed Canon's Power Notebook, a 100-MHz

603e PowerPC machine that is an IBM ThinkPad 755CD look-alike, in First Looks, August 1995. But for all its appeal, this notebook will face tremendous competition from a coming slew of 75-, 90-, and 120-MHz Pentium notebooks that will offer far more software choices and probably cost less, too.

FirePower, the group of former NeXT engineers that turned to developing PowerPC hardware clones—and helped Apple and IBM develop the prototypical PowerPC Reference Platform (PReP) machine—is moving toward production of complete PowerPC clones for third-party vendors interested in sampling the market for PowerPC machines without committing production resources. So we may finally see some of those innovative clones we've heard so much about.

THE FUTURE

The PowerPC partners may yet turn the chip line's "too little, too late" reputation into a solid base for an assault on Fortress Intel. Customers, however, should think twice before enlisting in that war. For now, we'd say the PowerPC is still a waiting game. □

► FACT FILE

Tangent MediaStar 5133



Estimated street price: \$5,295 **Processor/memory:** 133-MHz Pentium, 64 MB RAM, 512K external cache **Data storage:** 1GB Fast ATA-2 hard disk, Reveal quad-speed CD-ROM drive. **Display:** ATI Graphics Pro Turbo 4096, ADI MicroScan 5EP 17-inch monitor. **Software:** Microsoft Windows NT 3.51 **In short:** This Pentium system—a past Editors' Choice selection included for comparison with the new PowerPC machines—beat the PowerPC systems on our tests using Microsoft applications but lagged in graphics-intensive tasks. It is substantially less expensive than any of the PowerPC alternatives.

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NETWORK OPERATING SYSTEMS

SERVING UP APPS

If downsizing is the battle cry for cost-conscious organizations involved in applications development, then client/server technology is the weapon to win the war. With their rapid applications development (RAD) tools, advanced graphical user interfaces (GUIs), multiprocessing capabilities, and highly evolved 32-bit network operating systems (NOSs), client/server systems offer a price/performance combination that runs rings around that of centralized mainframe and minicomputer systems. The client/server model leverages the vigor of the desktop PC with the value of low-cost servers for many applications, resulting in a powerful and flexible environment.

Purchasing the proper application server NOS for your client/server application requires careful planning. Performance and reliability are key considerations,

Many of today's Intel x86-based NOSs have the power and features to run server applications. But which server NOS is right for your business needs?

By David S. Linthicum

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since the application server needs to service hundreds—possibly thousands—of clients. Application server NOSs that support preemptive multitasking, in which the OS manages the processing of concurrent tasks, and multithreading, which allows individual applications to run multiple functions concurrently, are crucial in such environments.

Scalability is another factor: The application server NOS you choose must be able to grow with the business. NOSs that support multiprocessing—the ability to divide tasks among multiple processors—are the most scalable. Setup, installation, and hardware support are also important considerations, since installing an application server NOS can take anywhere from a few hours to a few days.

Most important, you need to consider the intended use. In many cases an application server is dedicated to a single purpose, so it often makes sense to build the application server around the application, not vice versa.

REVIEW CRITERIA

To make it into this evaluation, an application server NOS had to run on an Intel x86-based server and had to provide support for multiprocessing, preemptive multitasking, and multithreading. We also looked for NOSs with fault-tolerance features that are capable of sustaining mission-critical applications. We put four products to the test: IBM's OS/2 SMP 2.11, Microsoft Windows NT Server 3.51, Novell's UnixWare 2.01, and The Santa Cruz Operation's SCO OpenServer Release 5. Note that OS/2 SMP is not a NOS, since on its own it fails to provide any networking capability. However, it is frequently run as an application server OS in combination with IBM's OS/2 LAN server, so we tested it that way. In early 1996 IBM plans to release OS/2 Warp Server, which the company says will offer new management features. IBM also plans to

include multiprocessing capabilities in OS/2 Warp Server—if not out of the gate, then soon after.

Sun's Solaris x86 2.4 also fit our filter. Unfortunately, at the time of this review, our testing suite for Solaris was still under development, so it is reviewed in a sidebar ("Sun's Spot").

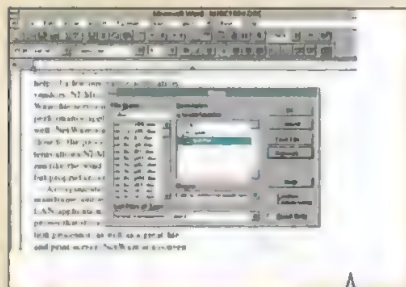
Note that neither Novell's NetWare 3.12 nor NetWare 4.1 supports preemptive multitasking, multithreading, or multiprocessing (see the sidebar "NetWare and Applications Processing"), so they were not tested for this review. Novell will provide support for preemptive multitasking and multiprocessing in its upcoming NetWare 4 SMP, due to ship later this year, but will not provide the degree of fault tolerance and other application server-specific features that are offered in UnixWare.

For each NOS, we took a close look at application server performance, setup and configuration, fault tolerance, and management utilities.

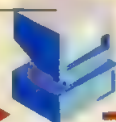
File Servers and Application Servers

FILE SERVER

File servers act as remote disk drives, taking requests for files from clients and sending the entire files back across the network to the clients for processing.



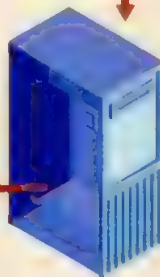
Client PC running word processor



User directs the application to open a file stored on the Q: drive.

Networking software in the client computer redirects the request to the file server's hard disk

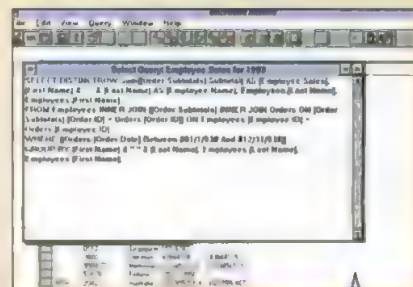
The file server retrieves the file and sends it across the network to be downloaded into the client PC's memory



APPLICATION SERVERS

Application servers do most of the processing of data, sending only the results back to the clients. This significantly reduces traffic on the network.

Database Management



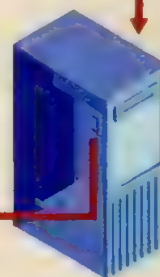
Client PC running database front end



User requests a list of 1993 sales sorted by employee's last name.

The client PC sends a query in SQL format (shown on-screen) to an application server running a database management back end.

The application server performs searches, sorts, calculations, and indexing based on parameters requested in the SQL statement, and sends the results back across the network to the client PC.



Our conclusions? The right NOS for you may depend more than anything else on your own needs and abilities. For example, if you can't seem to remember how to use the "DIR" command of DOS now that Windows is around, you may want to avoid the Unix-based NOSs (SCO OpenServer and UnixWare) in favor of Microsoft Windows NT Server 3.51, which is easy to install and manage and shows excellent performance. However, if the Unix commands "cp" and "ls" don't frighten you, we found that the two Unix-based NOSs provide superior performance and scalability. Of the two, you're better off with UnixWare if you run in a NetWare environment.

However, if you're more interested in vertical-market application support, take a hard look at SCO OpenServer Release 5 (though keep in mind that UnixWare claims to run OpenServer applications in its SCO-compatibility mode).

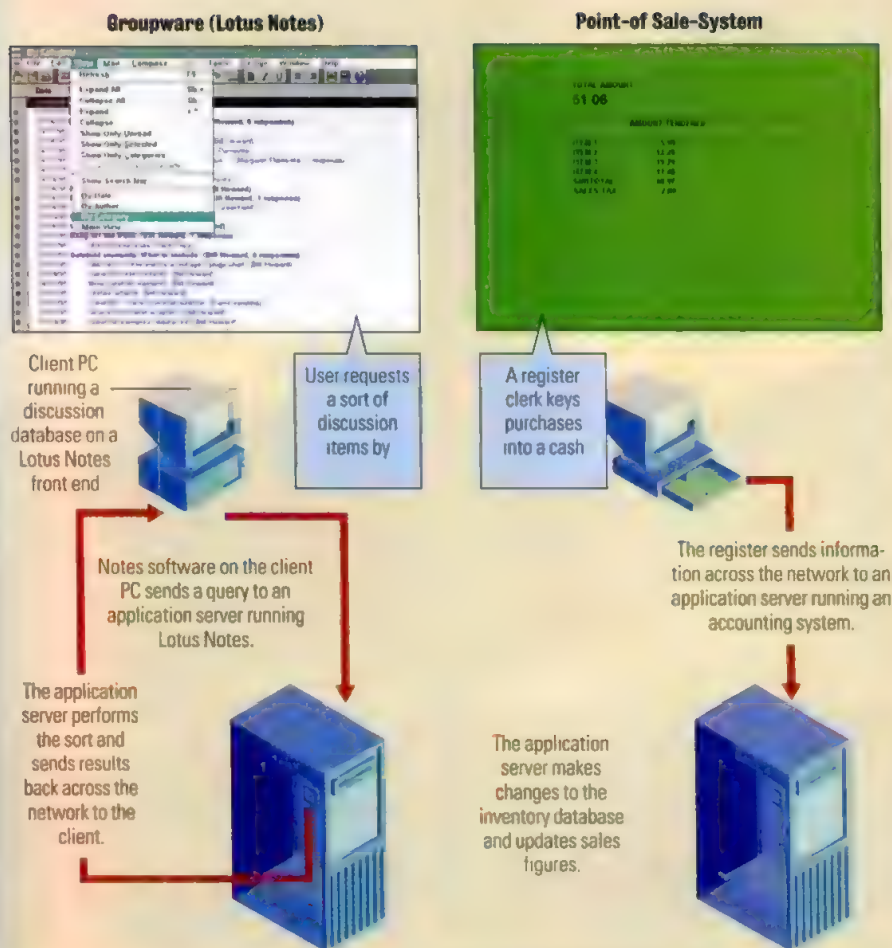
The combination of OS/2 and SMP/LAN Server had fewer features and poorer performance than the other three, but there are plenty of applications that run well on OS/2, including Lotus Notes. The trick is to determine your requirements, then examine the features of each NOS to determine the best fit.

Application server NOSs exist to support client/server computing. The basic

concepts of the client/server model are simple. Rather than processing applications on large and costly centralized mainframes or minicomputers, developers split the processing load among two or more client and server systems (see the diagram "File Servers and Application Servers"). Typically, the client is a PC that runs a GUI-based application in Windows; the server is a high-end single or multiprocessing system that runs a 32-bit NOS and either a database management system (DBMS) or some kind of groupware application such as Lotus Notes.

The client and the server exchange information over the network. The client sends requests to the server, and the server processes those requests for the client. This simultaneous processing allows client/server systems to deliver close to mainframe performance for only a fraction of the cost. In addition, since the client and the server exchange only requests and responses to requests, client/server systems produce much less network traffic than traditional PC-based file server environments.

You can get to a client/server setup in one of two ways: by upsizing or by downsizing. *Downsizing* means that developers take applications that run on centralized mainframes or minicomputers and migrate them to the client/server environment. For example, you would move a mainframe-based application accessing a local mainframe database to client/server by splitting the application into two or more tiers—usually the interface running on the desktop PCs and the database management system running on the application server. *Upsizing* is the same process in reverse;



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Microsoft Windows NT Server 3.51

While no single application server NOS is right for every business, some offer a more attractive blend of performance, scalability, fault tolerance, and ease of use than others.

Microsoft Windows NT Server 3.51 earns our Editors' Choice for its balance of features and performance. Not only was it the easiest product to set up, taking about an hour total with no tuning required, it also performed well. It came in third on many of our tests, but across larger client loads Windows NT consistently closed the performance gap with UnixWare and SCO OpenServer.

Windows NT stood out in other ways, too. Unlike any other product reviewed, Windows NT is available for several RISC platforms (although OS/2 may be available on the PowerPC in the near future). Windows NT Server also has fine NetWare integration features, and Microsoft is finally offering products that will make NetWare integration even easier (such as its NetWare File and Print Services, currently in beta).

Finally, although all of these NOSs have good development tools, Microsoft offers a complete spectrum of software products—from desktop applications and OSs to its Back-

Office suite of server applications. You may not find as many applications written for Windows NT as there are for SCO OpenServer and OS/2, but Windows NT is clearly the most forward-looking of the products reviewed here, and many newer applications have been written to run on it.

UnixWare 2.01, from Novell, receives an honorable mention: It screamed through our tests with the top scores, with very good scalability across heavy client loads. Its NetWare integration, while quirky, was also good, and Novell promises to combine the two families of NOSs further with hooks for NetWare Directory Services (NDS) in the future. We also found UnixWare's development tools well-rounded.

SCO OpenServer Release 5 was the second-best performer in our testing, after UnixWare, and actually scaled better on some tests. This new release from SCO also features a graphical interface that was easy to use, and applications for SCO OpenServer number in the thousands. However, compared with the other products, hardware support was limited, and installing and tuning the NOS was complex.

OS/2 SMP 2.11 was not as full-featured as the other NOSs we reviewed. In fact, to get many connectivity options, we needed to install a separate product, OS/2 LAN Server.

Also, we found that OS/2 LAN Server could not match the performance or scalability of the other NOSs; IBM says the performance hit is the result of a tradeoff that comes out of OS/2's compatibility with 16-bit applications. But don't count OS/2 out of the game yet: IBM plans to introduce OS/2 Warp Server in early 1996, which will integrate LAN Server with the core operating system.



you start with a typical PC-based file-server setup, in which files reside on the server and all processing is done on the clients.

THE BOTTOM LINE

Technology may influence the downsizing movement and the move to client/server, but cost drives these trends. It's simply cheaper to run business-critical applications on Intel-based workstations and servers than on minicomputers and mainframes.

As the price/performance benefits become apparent, Intel's Pentium is becoming the processor of choice for multiprocessing servers and the NOSs that support them. Offered by hundreds of vendors, Pentium systems tend to be priced lower than RISC competitors yet are not very far off in performance for most business applications. And as the Pentium has gained acceptance in the multiprocessor community, NOS vendors have followed up the lead with advanced NOSs to sup-

port multiprocessing on x86 systems. Windows NT, for example, was built from the ground up for multiprocessing. IBM's OS/2, SCO OpenServer, and Novell's UnixWare are committed to Intel-based multiprocessing, and even holdouts like Novell's NetWare will be moving to SMP (see the sidebar "NetWare and Application Processing"). Intel's MPS1.1 specification offers design guidelines for manufacturing low-cost SMP systems with commercially available components.

WHAT WE FOUND

We used our test suite ServerBench to test NOS performance. ServerBench tests not only how each NOS responds under its own internal processing load but also how it responds under the strain of 1 to 60 client connections running on single- and multiprocessor configurations. This provides a realistic look at how each NOS responds under the stress and strain of normal application processing. As you can see

from our results, the top performer was UnixWare, with SCO OpenServer a close second, then Windows NT, and OS/2 SMP bringing up the rear.

Performance is important, but you also want to make sure your application server NOS provides easy installation and configuration, and robust management and fault-tolerance features. Many companies will also be looking for easy integration with NetWare. We found a wide array of such features in these 32-bit NOSs, some outstanding, others not yet ready for prime time. Installation and setup procedures, for example, vary greatly. While it took about an hour to set up most of the NOSs, installing OS/2 took five, mostly because of hardware incompatibilities. However, OS/2 can auto-detect more devices than SCO OpenServer, and OS/2's installation was GUI-based, in contrast to SCO OpenServer's unfriendly character-based set of screens.

Although all the NOSs provide some

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sort of connectivity with NetWare, each does so in its own special way, some better than others. All but OS/2 SMP (with LAN Server added) could successfully link to a NetWare file server. UnixWare initially had more trouble connecting to NetWare than SCO OpenServer or Windows NT did. However, UnixWare offers more cross platform tools than SCO or Windows NT.

All four NOSs have fault-tolerant features. Each provides its own advanced file system. SCO OpenServer and UnixWare support *journaling*, which allows them to keep records of transactions so they can quickly recover if trouble occurs. All except OS/2 offer RAID support, either bundled (as with Windows NT) or as an add-on product. Windows NT and OpenServer can even talk to UPSs to detect power failures and auto-shutdown.

We found that management tools vary greatly as well. In general, both Unixes provide a wider array of management utilities than Windows NT or OS/2. However, in the case of SCO OpenServer, you have to access them through an uncomfortable

combination of a GUI and Unix command lines. UnixWare, Windows NT, and OS/2's interfaces are much more familiar and intuitive for the average PC user.

OTHER CONSIDERATIONS

Check out the availability of development tools, database management systems, groupware applications, and administration software for each of the NOSs you're considering. While most NOSs provide competent development tools, the range of types and the number of tools vary. The availability of database-management systems varies from NOS to NOS as well (see the sidebar "Of NOSs and DBMSs").

When looking at the price of each NOS, you need to look beyond the initial cost per user and seriously consider ongoing administrative costs. Our tests indicate that you'll probably spend more time managing SCO OpenServer than UnixWare, OS/2, or Windows NT. Windows NT, our Editors' Choice, provides the best bang for the buck, with good price/performance and easy-to-use management tools.

Microsoft Corp.

Microsoft Windows NT Server 3.51



We gave Microsoft Windows NT Server 3.51 an Editors' Choice based on its combination of management tools, fault tolerance, performance, and ease of use. The comfortable user interface is much like that

of Windows 3.x, but underneath sits a 32-bit, SMP architecture that provides solid, scalable performance, along with a very stable platform for critical business applications. In short, Windows NT seems poised to usher in the new era of PC client/server applications.

Unlike any other NOS in this roundup, Windows NT is available on Alpha, Intel x86, MIPS, and PowerPC platforms. Integration is not seamless, but now you have a choice of platforms without struggling with the hardware limitations and complexity of traditional Unix operating sys-

HIGHLIGHTS

Application Server NOSs

The advantages of deploying Intel-based application servers are beyond doubt, especially with one of these advanced, multiprocessing 32-bit network operating systems running the show. Once dominated by mainframes or expensive RISC-based machines, x86 server-intensive processing applications are a reality, thanks to blazingly fast PC hardware that has remained comparatively inexpensive. The result: powerful, flexible, and cost-effective solutions. Yet the real challenge of moving to client/server computing is not whether to do it but how.

PERFORMANCE and scalability are primary considerations in an application server NOS, which must service processing requests from hundreds of clients. Application server NOSs must have preemptive multitasking, in which the OS manages the processing of concurrent tasks, and multithreading, which allows applica-

tions to run multiple functions concurrently. Scalability is also vital: As you increase its workload, the NOS must be able to handle your processing volume.

APPLICATIONS and hardware may be your starting points in deciding on an application server NOS. While availability of database or groupware applications was not part of our main criteria in this roundup, you'll want to check to see what's out there, or at least what development tools are offered for the platform. Hardware support is also an important consideration. Some NOSs—particularly Microsoft Windows NT Server—provide drivers for more hardware than others.

NETWARE INTEGRATION will be another key ingredient, primarily because of NetWare's large installed base in PC LANs. If you have already made a commitment to NOS platforms

other than NetWare, however, your priorities will lie elsewhere. Although all the NOSs we reviewed work with NetWare in some way, they each do it differently, some with more problems than others.

FAULT-TOLERANT FEATURES

such as RAID are sometimes handled by hardware components, but software-based options offered by the NOS provide additional flexibility. Either way, you will not want your server to founder, and integration with external fault-tolerant devices is a bonus.

MANAGEMENT TOOLS provided by NOSs have become much easier to use, even for the Unix-based products (which have a history of hard-to-learn text-based commands). A GUI should not trade ease for effectiveness, though. We found we sometimes needed to dig under the pretty shells to get work done.

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APPLICATION SERVER NOS

Suitability to Task

SUITABILITY TO TASK

Setup and configuration	
Integration	Fair
Fault tolerance	Good
Management and security	Good
Performance	Good

Most **fault tolerance** is actually performed in hardware, but the NOS is responsible for some critical functions. First, the hard disk subsystem should be protected using the mirroring or duplexing features of the NOS's built-in hard disk, or other RAID-level support. Second, NOSs should provide optional software for mirroring the entire server. For application servers, some type of transaction tracking and fallback mechanism should be available.

Good server **management and security** can provide valuable insight into capacity planning and give early indications of problems involving the application server. Statistics, information, and suggested actions can help a network manager sleep at night. We look for high-quality information and excellent local and remote reporting tools, and give extra credit to packages that support upper-layer databases.

The **performance** rating indicates how well the NOS performed and scaled on our ServerBench tests using our standard load. NOSs rated *excellent* performed well with one or two processors and improved almost linearly with additional processors. We used our own internal ports of ServerBench written directly to the NOS itself.

No one wants to spend weekends on **setup and configuration**. Here we look at what it takes to set up hardware devices, user accounts, and clients. We also look at the number of drivers supported by a NOS. To achieve a rating of *excellent*, the installation process must be powerful, flexible, and easy. An installation routine supported by effective

Most people will start with NetWare 3.x. Our **integration** rating indicates how well a NOS fits into a NetWare environment. An *excellent* rating indicates full integration with NetWare 3.x, with no changes to desktop clients required. We also look for products that work with IPX and have authentication and security procedures that work with your existing NetWare. If you don't have NetWare 3.x, don't concern yourself with this rating.

tems. It may be a while before Intel platforms significantly displace the current base of RISC, AS/400, and mainframe hosts, but x86-based Windows NT is making great strides as a departmental application server.

THE END-TO-END NOS

Windows NT is ideal for companies developing client/server applications from the ground up using Windows clients. Unlike vendors that rely on third-party development tools and applications, Microsoft can provide every piece of software on both the front and back ends. Microsoft Visual Basic and Microsoft Visual C++ together provide both simple and powerful development tools that tie into Windows NT's Win32C application programming interface. Microsoft's SQL Server 6.0, a DBMS bundled as part of the Microsoft BackOffice suite, provides the final piece in the puzzle. (The BackOffice products include Windows NT Server, SQL Server, SNA Server, Mail Server, Systems Management Server, and a client-licensing module; Exchange Server will be added by the end of this year.)

Other server application vendors such as Btrieve Tech-

nologies, Lotus, Oracle, and Sybase have Windows NT products, and many more such products are expected. But because of Windows NT's relative youth—it was released two years ago—you'll find fewer vertical-market applications than are available for SCO OpenServer or OS/2.

Microsoft constructed Windows NT from the ground up as an SMP-capable, multithreaded, multitasking operating system, and our performance testing reflects the NOS's good architectural design. While Windows NT was beat out on almost every test by the two Unix products, it nevertheless showed good overall performance and scaling. And we didn't have

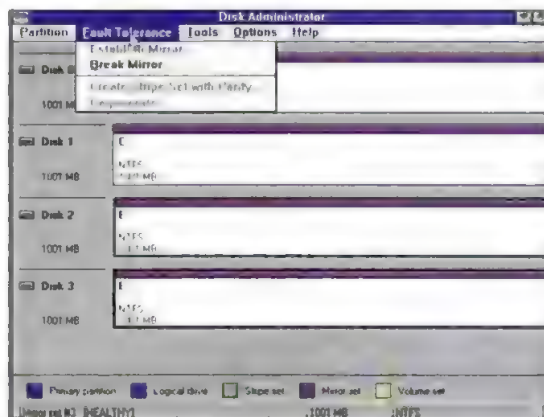
to tune Windows NT at all, whereas we spent many hours with expert engineers from Novell and SCO tuning their systems. Windows NT also beat out all other products when we scaled our tests to 120 clients (test results not included in our graphs).

PLUG IT IN

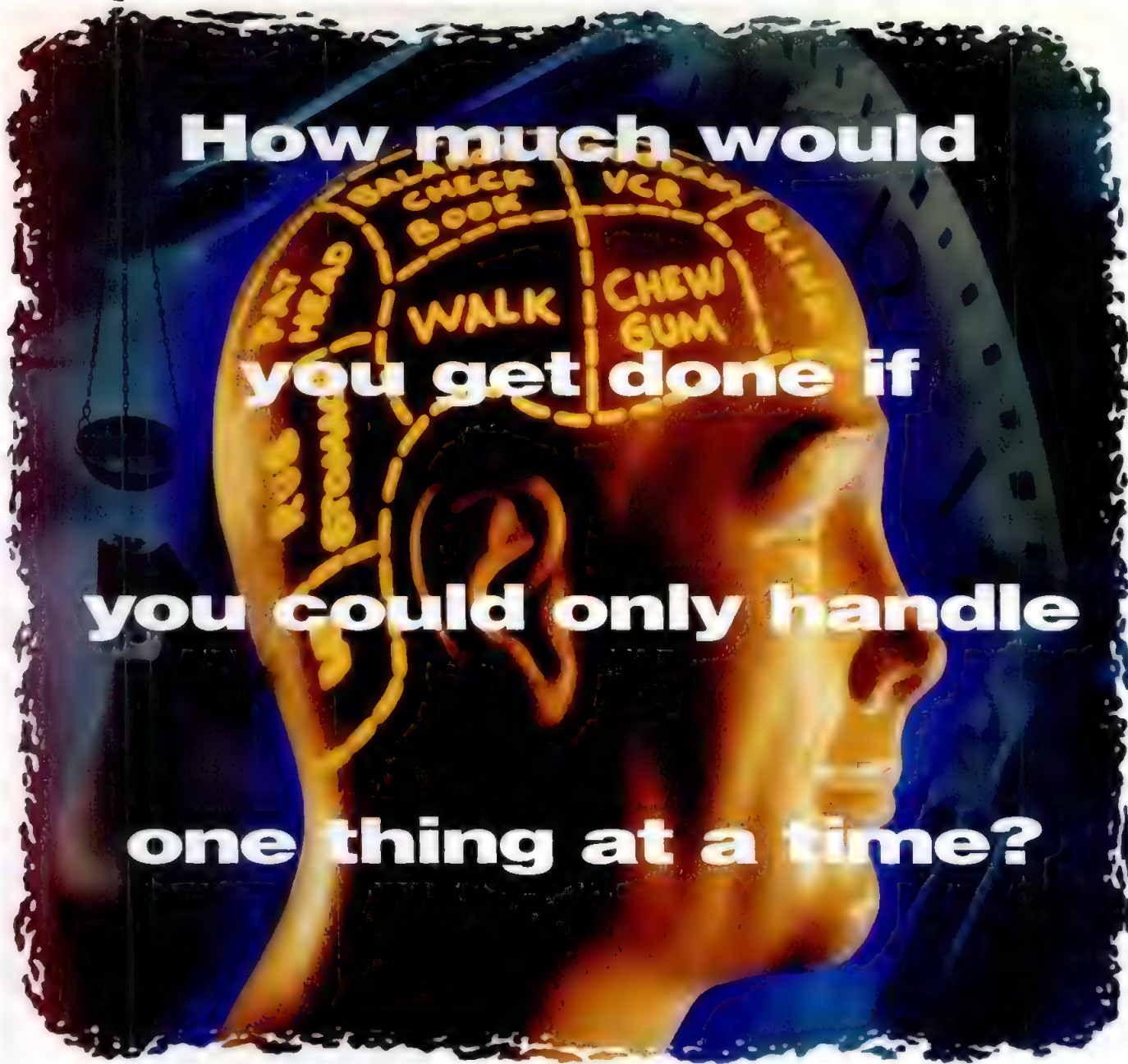
Even a novice can install and configure Windows NT. Simply load the CD and boot disk and the NT installation script prompts you from there. The only other product that came close to Windows NT on installation was UnixWare.

Windows NT not only has drivers for most of the hardware you are likely to encounter, it will even auto-sense and load the appropriate drivers for your hard disk adapters, network adapters, mouse, and keyboard. Windows NT also has a hardware abstraction layer (HAL) that makes it easy for system vendors to provide support for Windows NT. All of the new Intel-based SMP boxes, including those from Compaq, Hewlett-Packard, and IBM, work with Windows NT.

Windows NT truly is network-independent, with its inclusion of AppleTalk, NetBEUI, NetWare-compatible IPX/SPX (called NWLink), and TCP/IP. Windows NT includes the convenient Dynamic Host Configuration Protocol (DHCP), which allows TCP/IP addresses to be allocated dynamically: DHCP assigns IP addresses as



Microsoft Windows NT Server's Disk Administrator utility makes striping, mirroring, and duplexing hard disks almost effortless.



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NetWare and Applications Processing

By David S. Linthicum

NetWare, particularly in its 3.x incarnations, has long been the network operating system (NOS) market leader. As Novell moves forward with UnixWare 2.0 and the upcoming SMP version of NetWare (scheduled to be available from Novell licensees this fall), the question is: How will Novell position its operating environments for the application server market? Furthermore, how can you leverage NetWare to meet your applications processing requirements?

FILE SERVER SUPREME

When you think of file servers, you naturally think of NetWare. NetWare 3.12 is a 32-bit workgroup NOS that provides file and print services for clients running most desktop operating systems, including DOS, Macintosh, OS/2, Unix, and Windows.

NetWare 4.1 aims for the enterprise network as well as the workgroup, adding enhanced directory services for a single view of a multiserver environment. (See "The Versatile Network Operating System," May 30, 1995, for a review of NetWare 4.1.) NetWare Directory Services (NDS), introduced in NetWare 4.0, has a distributed database that provides single global access to all enterprise network resources.

APPLICATION PROCESSOR

As application server OSs, however, both NetWare 3.12 and 4.1 have their pluses and minuses. NetWare boasts several features, including Turbo FATs (file allocation tables) and directory and file caching, that are designed to speed up disk-data reads and writes greatly. And while most network operating systems provide layers of protection for system resources, NetWare accesses the server CPU and I/O subsystems directly.

NetWare loads server-based applications and utilities using NetWare Loadable Modules (NLMs), which is functionally equivalent to loading programs into memory for processing. NetWare's ability to run NLMs close to the processor and I/O subsystems allows NLMs to run like the wind. Vendors of NetWare-based database servers find that NetWare's unhindered I/O lets their products outperform database servers running on other NOSs.

NetWare is also a convenient place to run applications because it's already running in most organizations.

For Intel-based servers, Oracle has sold more NLM-based versions of its best-selling database than any other

version. Sybase also provides NLM versions of its SQL Server, and other DBMS vendors are following suit.

ZERO RISK

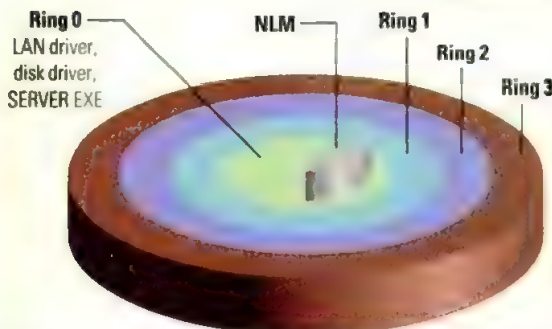
Unfortunately, what NetWare does to enhance performance for NLM-based applications leaves minimal protection from ill-behaved NLMs. When running NLM-based applications, Intel's Ring 0, which is usually reserved for the operating system, is defenseless. The lack of protection can result in a frozen server, lost data, or a damaged file system. Many organizations, in fact, refuse to run mission-critical applications on NetWare because of the risk.

Novell has attempted to address the NLM issue in NetWare 4.1, which gives administrators the option of testing NLMs in a protected-memory domain, called Ring 3, temporarily sacrificing performance.

The NetWare 4.1 memory subsystem also consolidates all memory allocation into a single pool to manage reallocation of memory released by NLMs. But these are stopgap measures; NetWare has a long way to go before it becomes a true application server NOS.

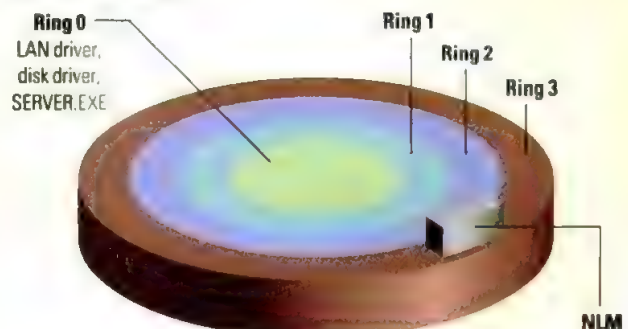
Scalability is also in question when you're considering NLM-based appli-

NLMs: Fast but Risky?



NetWare 3.12

NetWare 3.12 loads server applications using NetWare Loadable Modules (NLMs), which operate in Ring 0, Intel's most privileged CPU mode. This makes for fast performance, but a misbehaving NLM can cause data loss or a system crash.



NetWare 4.1

NetWare 4.1 attempts to solve this problem by letting administrators temporarily test an application in Ring 3, which provides extra memory protection. Most other server OSs run applications outside of Ring 0.

cations. While NetWare comfortably runs applications for small workgroups, it fails to provide the multiprocessing, preemptive multitasking, and multithreading features necessary for enterprise-wide application processing. NetWare 4 SMP, with its support for multiprocessing and threads, is designed to overcome this barrier, but it still uses NLMs and may be less cost-competitive than NetWare 3.12 and 4.1, when compared with the other application server NOSs reviewed in this feature.

For now, using NetWare as an application server can make good sense for small groups of users with I/O-intensive applications. NetWare also works well with database applications in which most of the processing occurs on the client.

WHICH WAY TO GO?

Novell seems to be on the fence when it comes down to selecting the best environment for application processing. Novell purchased AT&T's Unix Systems Labs in 1993 and developed UnixWare (reviewed in this feature) as an operating-system solution for mission-critical application servers.

For now, NetWare and UnixWare work well together. UnixWare can map NetWare volumes using the UnixWare systems, and UnixWare provides an NLM that gives users and applications direct access to NetWare files.

In addition, UnixWare and NetWare users can gain access to both environments through a single log-on. But UnixWare still doesn't have any NDS support. And its Unix heritage is enough to scare off many PC-oriented organizations.

It's not clear how Novell intends to differentiate NetWare 4 SMP and UnixWare as application servers. Novell currently promotes NetWare and UnixWare as complementary products, eventually aiming to combine them into a hybrid, which Novell has at times called SuperNOS.

they are needed, so not every client requires a dedicated address.

As with other products in this review, integrating Microsoft Windows NT Server into your LAN is easiest if you have clients with built-in Windows NT connectivity such as Windows 95, Windows NT Workstation, or OS/2 Warp Connect. To connect DOS or Windows 3.x clients directly to Windows NT, you need to add Windows NT client software to each.

Alternatively, by loading Microsoft's File and Print Services for NetWare (currently in beta), DOS or Windows 3.x clients configured with NetWare client software can directly access a Windows NT server.

Otherwise, network configuration was very simple. After we installed NWLink and TCP/IP in our test-bed, all networking functions were configurable from pick lists, dialog boxes, and menus. You never need to remember annoying command-line syntax. As in the other NOSs reviewed here, most configuration changes require a reboot to take effect, so be careful what changes you make during production hours. (NetWare—not reviewed here—does not require rebooting.)

No server runs unscathed forever, and Windows NT is designed to expect mishaps and crashes. With its internal architecture based on virtual machines and protected memory, rogue applications and processes won't affect other well-behaved applications on the server. We intentionally crashed a Windows NT server by turning off the power to test how well the NT File System (NTFS) recovered when restarted. After a few seconds of checking itself, the server was operating again without a hitch. SCO OpenServer and UnixWare handled the task equally well with their new journaling file systems. OS/2 currently does not include similar fault tolerance.

We used Windows NT's disk management utility to create various disk configurations using RAID level 0 to provide striping, level 1 for mirroring and duplexing, and level 5 for distributed parity protection. Windows NT has integrated support for any standard UPS; if the UPS reports that the power is down, Windows NT initiates a shutdown procedure. And although more powerful third-party backup products are available, the backup utility included with Windows NT works with many common 4-mm, 8-mm, and QIC drives.

FACT FILE

Microsoft Windows NT Server, Version 3.51

Estimated street price: \$999 (10-client license).

Requires: 386-based PC or better, 16MB RAM, 90MB hard disk space, CD-ROM drive. **In short:** Microsoft Windows NT Server came out ahead of the pack, based on its combination of management tools, fault tolerance features, performance, and ease of use. Although it came in third on our testing, it still performed well, and we didn't have to tune Windows NT at all. On the other hand, we spent hours tuning SCO OpenServer and UnixWare. And while there may be fewer applications for Windows NT than there are for the Unix platform, Windows NT delivers similar performance and features in a package that is easier to use.

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SUITABILITY TO TASK

Setup and configuration	Excellent
Integration	Good
Fault tolerance	Excellent
Management and security	Excellent
Performance	Good

MARVELOUSLY MANAGEABLE

Windows NT's management tools are straightforward to use and as powerful as those found with any of the products reviewed here. The Unix products also have GUIs, but for both SCO OpenServer and UnixWare you must rely on Unix command-line syntax to accomplish some tasks. For those who prefer a command line, Windows NT includes a series of statements with equivalent functionality.

The two most interesting management utilities are Windows NT's Performance Monitor and Event Viewer. The Performance Monitor utility provides a snapshot or ongoing history of key operating-system information relating to such areas as the processor, disk, and memory. The utility is powerful, but it takes a good understanding of the NOS to figure out what each counter means.

The Event Viewer is a welcome adjunct to the Performance Monitor; it's easier to understand but doesn't delve as deeply into the system. It shows both informational and critical messages about the system, and it helped us many times in diagnosing problems in our test-bed. Third-party application developers can write extensions to the Performance Monitor and the Event Viewer; the result is an integrated system management tool that surpasses those of other products.

Windows NT has the usual batch of utilities for user and group management, server management, and administration, and a nifty network-client installation utility. The well-known File Manager, Print Manager, and Control Panel utilities work similarly to their Windows 3.x counterparts. Like the Unix products, Microsoft provides an excellent security model and conforms to the C2 security standards.

Windows NT has a domain-based directory service that helps manage multiple Windows NT servers but is not open to third-party extensions. OS/2 LAN Server, which we tested with OS/2 SMP, has a similar service. Microsoft is promising a global directory like Novell's NetWare Directory Services (NDS) in a release of Windows NT in 1996, code-named Cairo. None of the products reviewed here have a global directory service, but we expect Novell's UnixWare to be first with an NDS hook.

Microsoft has delivered a high-powered operating system with a combination of price, performance, and features that beats competing NOSs, but has a relative lack of mature applications. While providing reliability and performance equivalent to the time-tested Unix derivatives, Windows NT delivers a package that works better and is easier to use. The combination of a powerful operating system with fast and reliable hardware makes the future for Windows NT application servers very promising.—Robert P. Lipschutz

IBM Corp.

OS/2 SMP 2.11

By itself, OS/2 SMP does not provide any networking capability. Unless you add an OS/2-based network operating system such as LAN Server 4.0 (with which we reviewed it), OS/2 SMP is merely a very powerful desktop operating system. OS/2 SMP also suffers from a lack of integration with other networks, the weakest performance on our benchmark tests, and weak management and fault tolerance. However, hundreds of server applications are available for OS/2, and you may find one that is the best for your business.

IBM recently announced development of OS/2 Warp Server, which will combine the features of OS/2 Warp Version 3 and



OS/2 SMP by itself doesn't provide many connectivity options; you'll need to install OS/2 LAN Server (shown here).

LAN Server 4.0. Expected to ship early in 1996, the new server is positioned to take on Microsoft Windows NT Server in ease-of-use and integration features. IBM says that OS/2 Warp Server also will include a NetWare 2.x and 3.x migration utility and enhancements to its backup, management, remote access, and print functions. IBM has also committed to including support for multiprocessing in OS/2 Warp Server.

OS/2 SMP works only on Intel x86 hardware platforms (486 or better) and was designed to work with all of the OS/2 applications on the market. Some of the more popular client/server applications that run on OS/2 SMP include Lotus Notes and database management systems from Ingres, Oracle, and Sybase. For a long time OS/2 was the only operating system that ran Lotus Notes, and *PC Magazine* has found that Notes still installs easily and performs well under OS/2. In addition, hundreds of line-of-business applications are available only for OS/2, such as IBM's DB2/2.

OS/2 SMP emerged in last place on our benchmark tests and did not scale as well as the other NOSs. One reason is OS/2's SMP implementation, which sacrifices some performance in order to achieve compatibility with 16-bit applications written for Windows 3.x and DOS, as well as some native OS/2 applications. Many of these older software programs and drivers manipulate hardware interrupts directly, so in order to run them, OS/2 SMP directs all interrupts to one processor, known as the *boot processor*. This means that any interrupts induced by other processors have to be handled by the boot processor, which makes the bal-

ancing of workloads inherently less efficient than with a NOS that can service interrupts on any processor in an SMP system.

In addition, OS/2 SMP is preemptive only up to a point: Unlike with Windows NT, threads that are assigned to one processor cannot be rescheduled or re-assigned to another processor until they finish executing. Therefore, any thread with a high priority cannot be processed until other lower-priority threads have been processed and returned to the user.

SLOW START

Complete installation was generally uncomplicated but took us a total of 5 hours, the result of formatting problems and attempts to load patches and fixes. If you are familiar with OS/2 Version 2.1 or later, you should have no problem installing the SMP version. The interface is the same, and you do not have to supply any additional information about your multiple processors.

Users who are unfamiliar with OS/2 should not encounter major snafus, either. The installation program can detect

FACT FILE

OS/2 SMP, Version 2.11

List price: 1 or 2 processors, \$395; up to 16 processors, \$489. OS/2 LAN Server 4.0 Advanced, \$1,799 plus \$39 per client. **Requires:** 386-based PC or better, 12MB RAM, 60MB hard disk space. **In short:** While OS/2 SMP offers the power of multiple processors, it lacks some important features of a powerful client/server platform. OS/2 SMP is basically a very powerful desktop operating system; it requires separate purchase of OS/2 LAN Server 4.0 for any network connectivity. OS/2 SMP also showed poor performance, weak management, and almost no fault-tolerance features. Complete installation took us 5 hours, longer than any other OS reviewed. However, thousands of server applications are available for OS/2 (including Lotus Notes, which IBM now owns), and you may find one that is the best for your business.

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SUITABILITY TO TASK

Setup and configuration	Fair
Integration	Fair
Fault tolerance	Poor
Management and security	Poor
Performance	Fair

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CIRCLE 073 ON READER SERVICE CARD

Benchmark Tests: Application Server NOSs

UnixWare clearly led the pack in performance and scalability with multiple processors. SCO OpenServer and Windows NT also tested well. Windows NT needed less tweaking than either Unix OS.

What the Numbers Mean

The operating systems in this roundup should cover your architectural wish list for an application server. Each is a 32-bit, multiprocessing, preemptive, multithreading OS with high-performance file systems and memory management. Testing showed how well relevant services—particularly performance scaling and thread dispatching—are implemented as processors are added to the server.

Novell's UnixWare 2.01 proved to be our top data cruncher, turning in the best ServerBench scores by client load and by number of processors. With four processors, UnixWare maintained nearly 100 TPS across all 60 clients. SCO OpenServer Release 5 and Microsoft Windows NT Server 3.51 also offered good performance and scalability. OS/2 SMP 2.11, though it showed almost linear scaling, was unable to keep pace with the high transaction rates of the other operating systems.

THE BENCHMARK TESTS

Our ServerBench 2.0 tests simulate a database application's activity, measuring the number of transactions between networked clients and servers based on a mix of processor, disk, and network subsystem tests. The intensive processor tests execute a sequence of calculations, searches, and sorts within 400K of data in memory. The disk tests consist of typical application server read, write, and file-append activities. The network tests reflect the back-and-forth movement of data characteristic of client-to-server connections.

While ServerBench's transaction mix will overwhelm the CPU in a single-processor test, adding processors to the server removes this bottleneck. A NOS's scalability is defined as its capacity to distribute operations across multiple processors and resources.

Part of UnixWare's high performance can be attributed to its design. Its advanced Unix System V SVR4.2MP kernel offers a completely multithreaded,

preemptable system. The single-processor scores show that UnixWare handled our lower client loads significantly better than the other products tested. With one CPU, UnixWare effectively delivered a peak of 41 TPS, averaging 35 TPS across the full client range. This compares with average scores of 28 TPS for SCO OpenServer, 25 TPS for Windows NT, and 20 TPS for OS/2.

Though UnixWare turned in excellent scores, Windows NT scaled well proportionally, closing the gap at higher client counts with four processors. In ad-hoc testing with four CPUs and a 120-client load (not shown in our chart), Windows NT performed as well as UnixWare, beginning to edge ahead at 96 clients while UnixWare declined.

The new SCO OpenServer has made some dramatic performance improvements over its previous version, SCO with MPX ("The Versatile Network Operating System," May 30, 1995). Though based on the System V Unix kernel like UnixWare, SCO OpenServer uses an older kernel technology, System V 3.2, which is not completely multithreaded. With one and two processors, SCO OpenServer had scores second only to those of UnixWare. With heavy client loads, SCO OpenServer offered the best three-processor performance, with an average of almost 80 TPS. But from three to four processors, SCO showed little performance gain.

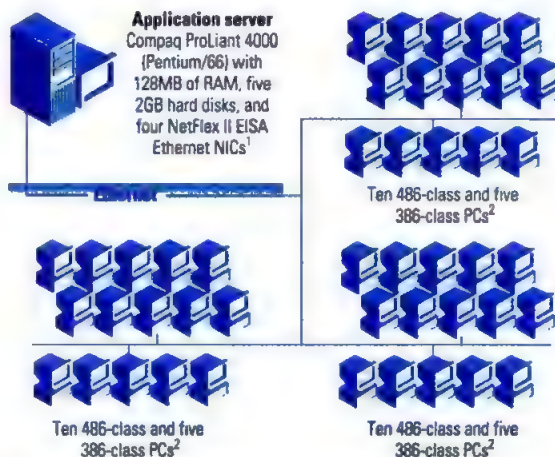
OS/2's inability to produce the high transaction rates achieved by the other products can be traced to its SMP implementation. OS/2's multiprocessor capability trades in some performance to retain compatibility with OS/2, DOS, and Windows 3.x applications. To preserve driver compatibility, all system interrupts are dispatched through the boot processor, requiring it to work harder than the other CPUs.

MAINTAIN YOUR NOS

An application server's NOS is one part of a three-part puzzle: On one side is hardware, on the other are the applications themselves, and the OS lies in the middle. Keeping the NOS working well with your applications and hardware platform requires all the latest patches, fixes, and tuning parameters for best possible performance. We asked each vendor to supply us with a configuration and enhancements so that its product was optimized for the ServerBench tests.

Hardware and driver support are always concerns to the network administrator. For each OS, we allowed the vendor to choose the network interface card. All chose the Compaq NetFlex II, except for The Santa Cruz Operation,

Test-Bed Configuration



¹ We tested SCO OpenServer Release 5 with four Novell/Eagle NE3200 Ethernet NICs.

² Each client was configured with Windows for Workgroups 3.11 and 8MB of RAM.

SERVERBENCH

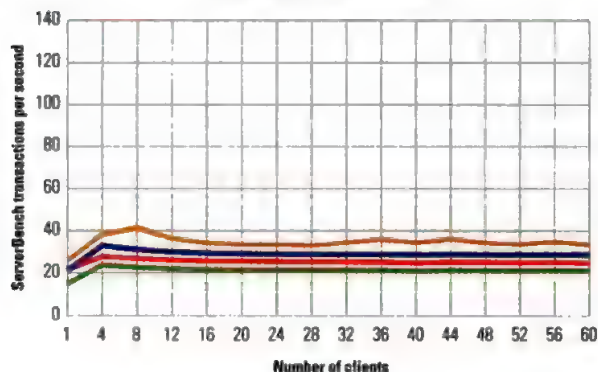
Microsoft Windows NT Server 3.51

OS/2 SMP 2.11

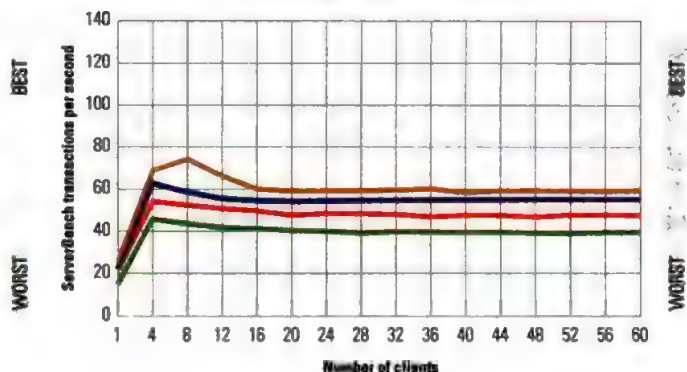
SCO OpenServer Release 5

UnixWare 2.01

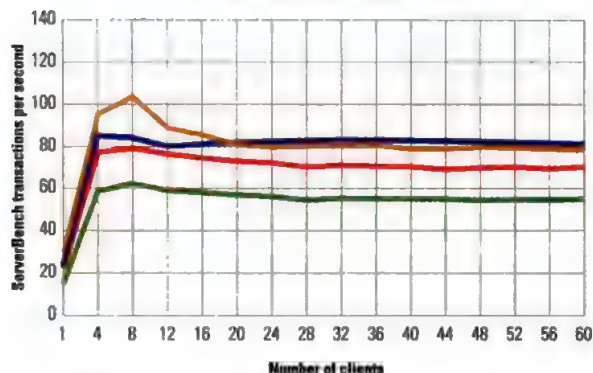
One processor



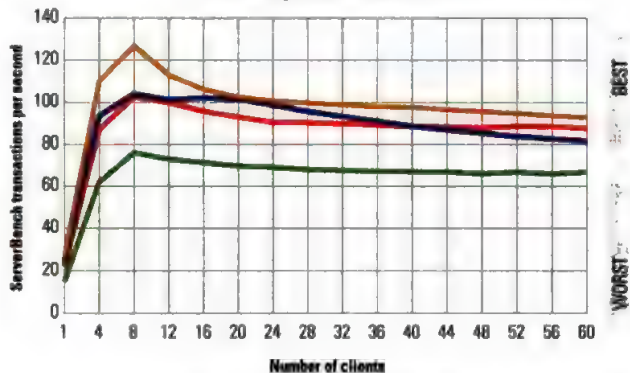
Two processors



Three processors



Four processors



which opted for the Novell/Eagle NE3200. At the time, the NE3200 was the only card with a multithreaded driver for SCO OpenServer. Microsoft and Novell used shipping drivers for testing, and IBM provided a downloadable driver.

IBM's LAN Server Advanced 4.0 was loaded with OS/2 SMP in order to take advantage of the HPFS386's unlimited cache size, not available in the basic OS/2 High Performance File System (HPFS). In addition, IBM included patches for SMP and LAN Server Advanced 4.0. SCO provided us with a new High Throughput File System (HTFS) driver to handle random and sequential I/O more efficiently.

All setup and tuning parameters were determined after consulting with the ServerBench team at Ziff-Davis Benchmark Operation (ZDBOp) and each vendor. The Unix products required tuning for network conditions such as open files and shared memory based on the number of network users. In addition to the patches for OS/2, IBM gave us numerous modifications to CONFIG.SYS. Windows NT's only requirement was that we set the server for maximum throughput.

Keep in mind as you look at our numbers that no single benchmark test should be used to make your buying decision. You'll need to profile your application carefully; there are a number of ways to implement client/server design. For example, your application might perform more I/O than our benchmark tests measure. ServerBench's standard transaction mix

tends to be processor-intensive, not stressing the subsystem the way a highly concentrated database application might.

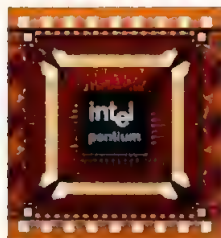
—Analysis by Jeffrey G. Witt

How We Tested

ServerBench 2.0 submits workloads to the server starting with 1 client and then 4r clients. It then proceeds in 4-client increments up to our 60-client maximum. The resulting scores are measured in ServerBench transactions per second (TPS) and indicate the amount of data that a server can process at each client load. We added Pentium/66 CPUs one at a time to the server (up to four processors) to test system scalability. Our hardware platform consisted of a Compaq ProLiant 4000 with four Pentium/66 processors, 128MB of RAM, and five 2GB SCSI hard disks. We connected 60 client nodes via four 10-Mbps Ethernet segments running over unshielded twisted-pair (UTP) wiring.

We tested all products with the Compaq NetFlex II, except for SCO OpenServer, for which we used the Novell/Eagle NE3200. Each segment was identical, containing 15 machines ranging from 386SX- to 486DX-based PCs. Each client system had 8MB of RAM and was running ServerBench under Windows for Workgroups 3.11. No disk striping or fault-tolerant RAID levels were used for any of the products. Each OS was installed on the first drive and then ServerBench data files were distributed evenly across the four remaining disks. All high-performance file systems were used for each operating system. We used FTP Software's PC/TCP, Version 3.0, as the transport protocol for Microsoft Windows NT Server 3.51, SCO OpenServer, and UnixWare 2.01. For OS/2 SMP 2.11, clients were connected using NetBEUI for OS/2.

GET PENTIUM.



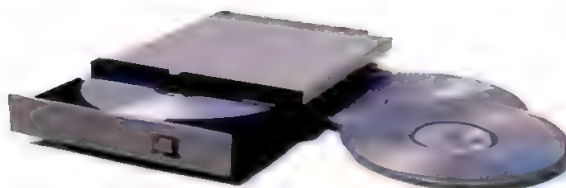
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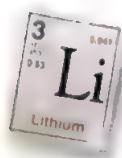
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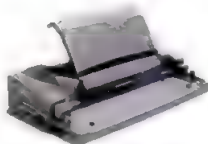


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CIRCLE 379 ON READER SERVICE CARD

the type of hardware you are using, including the number of processors, the type of hard disk, your video controller, and even your mouse. We initially were unable to format a 1GB hard disk using IBM's High Performance File System (HPFS). After we segmented the disk into two smaller partitions, we were able to complete the installation.

Unfortunately, once we had successfully installed and configured OS/2 SMP, we were only half done; we still had to install OS/2 LAN Server Advanced (which is sold separately for \$1,799).

LEANING ON LAN SERVER

While OS/2 SMP does not offer any built-in integration with other NOSs such as NetWare, adding LAN Server will let you connect your network client

PCs to your SMP server. For example, OS/2 Warp Connect, Windows for Workgroups, and Windows NT Workstation include software to connect to a LAN Server network. LAN Server also ships with client software for your network PCs running DOS, Windows, and OS/2 2.x.

Unfortunately, the NetWare requester for OS/2 does not work with SMP, so you will not be able to connect your SMP server to your NetWare servers. IBM is aware of this incompatibility, but this is a problem only if you need to access NetWare server resources (such as printers) from your OS/2 server.

As a standalone product, OS/2 SMP does not provide many fault-tolerant features such as RAID, disk mirroring, or disk duplexing. In fact, the only OS/2

SMP feature that will help you in the event of a hardware failure is a check-disk and undelete utility. Once you add LAN Server, you get some basic disk-mirroring and duplexing capabilities, but if you want full RAID support—which is commonly hardware-based anyway—you will have to use a third-party product.

Like Windows NT, OS/2 SMP uses a virtual-machines technique to protect individual applications running on the server. Each application runs in its own space in memory, so faulty applications should not lock up the system or interfere with other applications.

However, OS/2 cooperatively multi-tasks 16-bit applications, so if you use older 16-bit applications and run them simultaneously with 32-bit apps, you may

Sun's Spot: Solaris x86 2.4

By David S. Linthicum

With its roots firmly planted in the Unix-based Sun SPARC workstation market, SunSoft's Solaris moved into the PC world in 1993 with Solaris x86. Like the products we tested for this feature, Solaris x86 2.4 is a 32-bit NOS that offers multitasking, symmetric multiprocessing, and multithreading capabilities. However, we could not include Solaris x86 in our performance testing because ServerBench 2.0, our client/server benchmark test suite, was still under development for the platform at the time of this review. We did install the product and examine its features, however.

Solaris x86 2.4 is just as comfortable working as a server and as a workstation, and it is available in four versions: Solaris Desktop (\$795), Workgroup Server Lite (\$1,295), Workgroup Server (\$1,995), and Enterprise Server (\$2,495). We looked at Enterprise Server.

As an application server, Solaris x86's many strengths include easy installation, an advanced graphical user interface, good fault-tolerance features, full integration with Net-

Ware, and useful system-level utilities for monitoring performance and recovering from hard disk crashes. However, Solaris x86 has limited driver support for Intel-based hardware: Solaris buyers have to select hardware from SunSoft's short hardware compatibility list.

SunSoft claims that Solaris can support 32 processors on an Intel x86 platform. However, the only Intel-based servers available at the time of this review had a maximum of 6 processors. Windows NT can distribute tasks over as many as 1,000 processors, loosely coupled.

Finally, Solaris x86 has been around for only two years, so users will have fewer applications to choose from than with SCO OpenServer or UnixWare. But Solaris x86 is a perfectly good platform for developing applications.

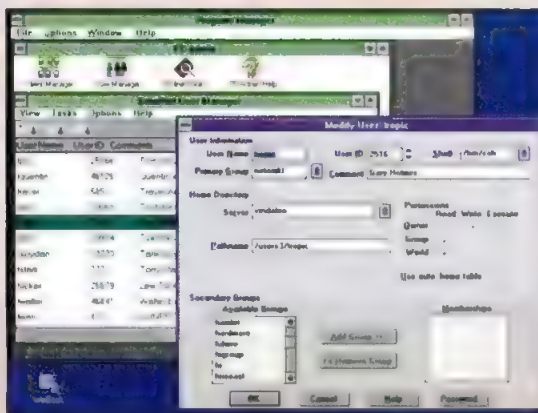
PUTTING THE BEST FACE FORWARD

Solaris x86 puts an attractive graphical user interface on the hostile Unix command-line shell. But we did find that if you're used to Windows or OS/2, Solaris's interface takes getting used to. Some knowledge of Unix command lines is a must for finer points of server management.

The CD-ROM-based automatic installation is a breeze. It walks the installer through every part of the installation and configuration process, and it even helps you customize Solaris for your particular uses (such as an application server, database server, or client workstation). It can also auto-detect host adapters, disk partitions, and CD-ROM drives, but not network interface cards.

TOLERANCE TO A FAULT

Solaris includes some good utilities to recover from hardware



SunSoft's SolarNet PC Server Services lets you give NetWare users access to files on a Solaris x-86 server.

encounter problems if one of the 16-bit applications hangs up.

Compared with Windows NT and the Unix NOSs reviewed, OS/2 SMP offers little in the way of hardware and software management. While Windows NT allows you to monitor your server's CPU utilization, hard disk, and memory usage, OS/2 SMP only provides a single utility, called Pulse, which monitors CPU utilization.

For network user and group maintenance, you must rely on the utilities that come with LAN Server to set up security and access to your client/server applications. LAN Server also provides network domains, a directory-naming scheme similar to Windows NT's, which makes it easier to manage and control multiple servers on your network.

failures. Using the new Online Disk Suite 4.0 facilities (standard with Workgroup and Enterprise versions), you get crash protection through disk mirroring plus Hot Spares, a feature that automates mirrored disk recovery.

A new journaling file system, similar to those of SCO OpenServer and UnixWare, measurably speeds up crash recovery and file-system checking. With its server versions, Solaris also includes a heterogeneous automatic backup and recovery utility that uses NetWorker backup software from Legato Systems. Disk striping is also offered to increase Solaris's I/O performance.

WELL INTEGRATED

The base of the Solaris's interoperability solution is ONC+—an enhanced version of ONC, a family of protocols (including TCP/IP and SPX/IPX) and distributed services that operate independently of a particular platform. This lets Solaris interoperate with other Unix and non-Unix OSs, without making you install third-party protocol stacks.

For integrating into NetWare environments, SunSoft offers Application Server Suite (\$2,490), which consists of Workgroup Server, SolarNet PC Server Services, and SolarNet PC Protocol Services. SolarNet PC Server Services

A primary LAN Server domain controller keeps track of all of the users on the network. OS/2 has been around since 1987, and there are hundreds of different applications that run on it. OS/2 SMP adds the flexibility and power of multiple processors, but it lacks some important features that a powerful client/server platform should include.

IBM and some other vendors offer NOSs that provide these important client/server features—including networking, server management, and fault tolerance—but you will have to purchase and install each of the featured items separately. With the release of OS/2 Warp Server next year, IBM looks to combine the best features of its OSs, and should deliver a very promising application server platform.—Steve Rigney

works together with a NetWare file server, providing NetWare clients with NetWare-compatible file and print services. PC Server Services gives existing DOS, Windows, and OS/2 NetWare clients access to files on a Solaris x86 server. No client installation is necessary.

SolarNet PC Protocol Services (PPS) provides the IPX/SPX-compatible networking protocol that lets NetWare clients execute workgroup applications on Solaris servers over IPX.

OPEN STANDARDS, FEWER APPS

While it has some good server features, native applications for Solaris x86 are scarce. The many applications for the SPARC version of Solaris won't run on the Intel version unless their code is recompiled. Solaris does include real-time development facilities, which puts it on a short list for OSs that support process-control applications. And in case you want to use Solaris as a database server, you'll find Informix and Oracle among the supported database engines.

Solaris x86 2.4. List price: Enterprise Server, \$2,495; Application Server Suite, \$2,490. SunSoft Inc., 2550 Garcia Ave., Mountain View, CA 94043; 800-227-9227, 415-960-3200; fax, 415-336-1736; Web, <http://www.sun.com>.

Circle 478 on reader service card

The Santa Cruz Operation Inc.

SCO OpenServer Release 5

The Santa Cruz Operation provides the market-leading Unix flavor for the Intel x86 platform, with the installations and applications to prove it. SCO OpenServer Release 5 improves performance, interoperability, scalability, and usability over the previous release. Its good fault-tolerance features, integration with NetWare, and abundance of vertical-market applications could make it the right choice for some. But SCO OpenServer has narrower hardware support and less impressive administration tools than other products we reviewed.

On our benchmark tests, SCO OpenServer came in a close second to UnixWare, the other Unix contender. We found that SCO OpenServer provides very good performance and scaling at most levels of user and processing loads. With three processors, SCO OpenServer gained on UnixWare and maintained its performance over higher client loads. But with four processors, OpenServer's performance degraded beyond 24 clients, indicating that on the ServerBench tests it was not as scalable as UnixWare.

SETUP TRIALS

When we installed SCO OpenServer, we found potential hardware incompatibilities and other setup problems. SCO OpenServer ships with a single floppy boot disk and a CD-ROM. The Intelligent Query Manager (IQM), SCO's new installation management system, allows the installer to configure the entire installation before starting installation from the CD. The IQM can detect most system components for installation, but not all. For example, it detected existing disk partitions (including DOS partitions), physical memory, available disk space, and even the NE2000 network card in our test machine, but it could not detect the NetWare network number, graphics subsystem, or types of I/O devices (such as the mouse).

We had the option of an automatic disk configuration, semiautomatic configuration, or custom installation. Unless you're willing to take the shrink-wrap off the manuals, your best bet is automatic, in which you provide TCP/IP information,

SUMMARY OF FEATURES

Application Server NOSs

Continues

PC MAGAZINE
EDITORS' CHOICE

■ YES ■ NO

Products listed in alphabetical order

	Microsoft Windows NT Server 3.51	OS/2 SMP 2.11	SCO OpenServer Release 5	UnixWare 2.01
Price (four processors)	\$3,299 (street)	\$6,188 (list)*	\$6,675 (list)	\$3,485 (list)
Maximum number of users	100	100	100	Unlimited
Setup and Configuration				
CPUs supported	DEC Alpha AXP, Intel x86, MIPS R4000m PowerPC	Intel x86	Intel x86	Intel x86
Minimum memory required	16MB	8MB	8MB	16MB
Maximum memory supported	4GB	512MB	512MB	4GB
Minimum disk space required	90MB	42MB	120MB	100MB
Maximum memory supported	408 million TB	1,600GB	950TB	28GB
Maximum file size supported	17 billion GB	2GB	2GB	2GB
Client types supported on the server	DOS, Mac System 7.x, Windows 3.x, Windows NT, Win- dows 95, OS/2 2.x	DOS, Windows 3.x, OS/2 2.x*	DOS, Windows 3.x, Windows NT, OS/2 2.x, Unix, X terminal	DOS, Windows 3.x, Unix, X terminal
File systems supported on the server	FAT, HPFS, NFS, NTFS	FAT (OS/2), HPFS (OS/2), HPFS386 (LAN Server)*	AFS, FAT, DTFS, EAFS, HTFS, NFS, Xenix	BFS, CDFS, FAT, NFS, SE, SFS, UFS, VxFS
Disk options:				
Spanning	■	■	■	■
Software striping	■	■	■	■
Server Design and Expandability				
Maximum number of processors supported	32	16	30	Unlimited
Maximum number of user connections per server	Unlimited	1,000*	Unlimited	Unlimited
Multitasking and multithreading	■	■	■	■
Maximum cache size	2GB	512MB*	Unlimited	Unlimited
Network security levels supported	C2	None	B2, C2, Kerberos	B2, C2
Access control list (ACL)	■	■*	■	■
Administrator can limit amount of hard disk space	■	■*	■	■
Offers intruder detection and lockout	■	■*	■	■
RSA public and private key cryptography	■	■	■	■
Passwords:				
Administrator can require periodic password changes	■	■*	■	■
Supports password encryption	■	■*	■	■
Types of password restrictions supported	Aging, length, unique	Aging, length, unique*	Aging, length, random, unique	Aging, length, unique
Protocols supported	AppleTalk, DLC, IPX/SPX, NetBEUI, NetBIOS, TCP/IP	NetBEUI, NetBIOS, TCP/IP*	IPX/SPX, NetBEUI, NetBIOS, PCI, TCP/IP	IPX/SPX, TCP/IP
Additional client/server protocols supported	APPC, Named Pipes, RPC, Windows sockets	Named Pipes, OS/2 sockets, Windows sockets*	BSD sockets, Named Pipes, RPC, Windows sockets	NCP, NFS, RPC, Windows sockets
Fault Tolerance				
Mirroring and duplexing	■	■*	■	■
RAID levels supported by OS	0, 1, 5	1*	0, 1, 5	0, 1, 5
Complete server fault tolerance (SFT III)	■	■	■	■
Backup support	■	■	■	■
UPS support	■	■*	■	■
Server Management				
Graphical environment	■	■	■	■
Network directory services supported	Domain-based	Domain-based*	CDS, DNS, NIS, X.500-based	DNS, NIS
Allows management of users from server console	■	■*	■	■
Information displayed:				
Cache statistics and utilization	■	■*	■	■

*—This information applies to the package as tested with OS/2 LAN Server Advanced 4.0.

host name, root password, NetWare information, and some device information.

But not so fast. SCO OpenServer doesn't support all hardware peripherals. For instance, if your disk controller or host adapter doesn't appear on the SCO OpenServer compatibility list you have to come up with a *boot-time loadable driver* (BTLD) from your device vendor. Even if a vendor has drivers from previous versions of SCO OpenServer, they may not work with Release 5. When using SCO OpenServer, you're better off building the hardware around the operating system, not vice versa.

Furthermore, SCO OpenServer does not recover well from information that is entered incorrectly during installation. To

*When using SCO
OpenServer,
you're better off building
the hardware around
the operating system,
not vice versa.*

correct such problems you'll have to use cryptic utilities such as the Unix MKDEV command, or do as we did: Start from the beginning.

NETWARE MEETS UNIX

As its name implies, SCO OpenServer integrates well with NetWare. SCO OpenServer is ready to act as an IPX/SPX client for a NetWare server right after installation. You can attach your SCO OpenServer server to a NetWare file server and mount the NetWare volumes so they become accessible from the SCO OpenServer file system—something we weren't able to do in OS/2 or without adding extra software in Windows NT.

Besides sharing files, SCO OpenServer can use printers attached to NetWare servers. SCO OpenServer even provides the NLMs you'll need to load onto your NetWare server to support the long file-names of Unix. Although third-party NetWare integration products are available for Unix systems, SCO Open-

SUMMARY OF FEATURES

Application Server NOSs

Ends

■ YES ■ NO

Products listed in alphabetical order

	Microsoft Windows NT Server 3.51	OS/2 SMP 2.11	SCO OpenServer Release 5	UnixWare 2.01
Error and system status log	■	■	■	■
I/O activity	■	■	■	■
LAN driver statistics	■	■	■	■
Logical/physical disk statistics	■	■	■	■
Memory usage	■	■	■	■
Number of open files	■	■	■	■
Number of packets and bytes transferred	■	■	■	■
Paging statistics	■	■	■	■
Percentage of CPU utilization	■	■	■	■
SMP system activity	■	■	■	■
Can assign single-reference time server	■	■	■	■
Includes agent for SNMP/CMIP	■	■	■	■
Includes agent for NetView	■	■	■	■
Remote network installation	■	■	■	■
Remote reboot	■	■	■	■
Audit trails supported				
Log-on/Log-off	■	■	■	■
Start-up/Shut-down	■	■	■	■
User	■	■	■	■
Groups	■	■	■	■
Databases Supported				
Btr eve	■	■	■	■
Gupta's SQLBase Server	■	■	■	■
IBM's DB2/2	■	■	■	■
Informix Online	■	■	■	■
Microsoft SQL Server	■	■	■	■
Oracle7 Server	■	■	■	■
Progress	■	■	■	■
Sybase SQL Server	■	■	■	■
Technical Support				
Phone number	800-936-5900	800-992-4777	800-726-8649	800-486-4835
Support hours (eastern)	24 hours, 7 days	8:00-5:00 M-F	9:00-8:00 M-F	9:00-8:00 M-F
Free support included in purchase price	None	60 days	None	30 days
Additional support fees				
Per incident	\$150	\$190	\$300	\$150
On-site	Varies	\$170 per hour (2-hour minimum)	\$1,500 per day	Varies
Annual packages	\$1,500-\$25,000	\$4,495-\$29,995	\$1,500-\$35,000	None
BBS number	206-936 6735	919-517-0001	408-426-9495	801-225-4444
CompuServe forum	GO WINNT	GO OS2SUPPORT	GO SCOFORUM	GO UNIXWARE
Fax-back support number	800-727-3351	800-426-3395	408-427-6800	800-486-4835
FTP site	ftp.microsoft.com	ftp.pcco.ibm.com	ftp.sco.com	ftp.novell.com
World-Wide Web site	www.microsoft.com	www.ibm.com	www.sco.com	www.novell.com

*This information applies to the package as tested with OS/2 LAN Server Advanced 4.0

Server's network solution proved seamless during our testing. To connect NetWare clients to an SCO OpenServer application server, as with UnixWare, you'll need to install additional software on client workstations.

SERVER INSURANCE

As an option, SCO OpenServer provides many impressive fault-tolerant and recovery features, similar to those of Unix

Ware but more sophisticated than Windows NT. The new High Throughput File System (HTFS) not only provides greater I/O speed than the previous file system but provides journaling protection as well. A journaling file system writes each transaction through the buffer cache into a journal during processing. This allows the HTFS to roll out an incomplete transaction and thus recover from system crashes faster. SCO

OpenServer was ready and waiting with no loss of data shortly after we turned the server off and rebooted.

Beyond journaling, SCO Virtual Disk Manager (sold separately for \$995) provides RAID support for levels 0, 1, and 5, as well as disk mirroring. SCO OpenServer can talk to some UPSs through an American Power Corp. device driver, which alerts system administrators and users of a power loss and performs an orderly shutdown (like Windows NT). The undelete feature of SCO OpenServer lets users recover files just removed from the file system, and the new backup manager for SCO OpenServer can execute and schedule regular file system backups.

SERVER SUPERINTENDENCE

With this version, SCO has added a GUI interface to work with the system administration features of SCO OpenServer, but for some advanced tuning you still need to use text-based Unix commands. Administrators now manage SCO OpenServer using the SCOadmin facility, a single-administration system that can run under the GUI or on a character-based terminal. The GUI, while it has an intuitive interface that guides you through tasks, is less comprehensive than Unix-

FACT FILE

SCO OpenServer Release 5

List price: Enterprise System (5 users), \$1,295; 10 additional user licenses, \$495. SCO merge or SCO WABI server license, \$995. **Requires:** 486-based PC or better, 12MB RAM, 250MB hard disk space.

In short: We found SCO OpenServer to be a good implementation of Unix on Intel with a lot of value added, including out-of-the-box support for NetWare and TCP/IP. It was also a strong performer on our test, bested only by UnixWare. SCO OpenServer provides a satisfactory installation routine and offers a high-performance file system that supports journaling and provides good data recovery features. New graphical server administration tools are easy to use and an improvement over this product's previous version, but those who manage SCO OpenServer still need to understand the dirty details of Unix.

SUITABILITY TO TASK

Setup and configuration	Fair
Integration	Good
Fault tolerance	Good
Management and security	Fair
Performance	Good

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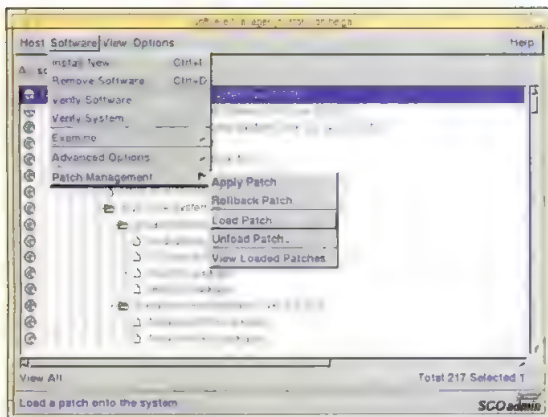
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Smart. Very smart.



SCO OpenServer's new graphical tool, SCOadmin, lets you manage your server more easily, but for some fine-tuning you'll need to know command line Unix.

Ware's interface.

Using SCOadmin, you can manage users, printers, file systems, system configurations, and other common Unix system-administration tasks. SCOadmin is a vast improvement over the user-unfriendly SYSADMSH of the previous version. The hardware/kernel manager utility lets you add device drivers as well as tune and relink the SCO OpenServer kernel. However, much of this is still text-based and difficult to use.

If you're serious about managing the performance of SCO

OpenServer, you may want to consider third-party products such as Olympus Tune-up for SCO OpenServer, from Olympus Software (\$695; 800-792-1273). Tune-up can monitor SCO OpenServer and tune for the optimal configuration based on your requirements.

For strong, stable performance, good fault tolerance, and a vast array of specialized applications from which to choose, this latest version of SCO OpenServer could be the best choice. But if you're a Unix novice looking to run general-purpose, departmental applications, you'll probably want to look elsewhere.

—David S. Linthicum

Of NOSs and DBMSs

By David S. Linthicum

It's no secret that most application servers will become database servers as corporate America continues to move business data off its mainframes. But what does a database server do, and what do you have to know about database servers in order to choose an application server operating system?

A database server system consists of server hardware, a network connection, a high-performance network operating system (NOS), and a server-based database management system (DBMS) such as Informix OnLine, Oracle7 Server, or Sybase SQL Server.

The DBMS performs database-processing functions for all types of

business applications that access its resources. In most organizations, the database server is the "server" in client/server. Developers split the processing between the client system, generally called the *front end*, and the database server, known as the *back end*.

The user requests certain data via database query tools or an application developed in-house. The front end then sends the request over the network to the back end, usually in structured query language (SQL) format.

The back-end database server processes the request by using its own processor and stored data, and then returns to the client only the data that has been requested. This creates much

less network traffic than a file-server arrangement in which all processing is done on the client and entire database files have to be retrieved from the server.

Most DBMSs also store and execute their own proprietary procedures (called *stored procedures* and *triggers*) that can be activated by a single client message. This reduces network traffic even more.

Some client/server systems use transaction processing (TP) software, such as Novell's Tuxedo and Transarc's Encina, to sit between the client and the server and manage the thousands of transactions that take place.

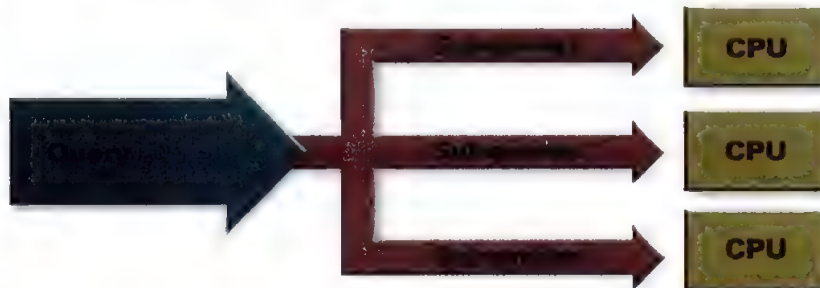
TP monitors provide fault tolerance, workload balancing, performance enhancements, and another location for business processing. DBMS software also provides real-time backups, database replication (duplicating database updates across a LAN or WAN), transaction logging for roll-back/roll-forward database recovery, and disk-mirroring services (locally or across the network).

THE BIG THREE

In the world of DBMSs, three giants roam the land: Informix OnLine, Oracle7, and Sybase SQL Server. All three provide relational database services and support a wide array of front-end

Multiprocessing DBMSs

Many of today's powerful database management systems take advantage of multiprocessing platforms by breaking a single query into subqueries, which are then processed concurrently on multiple CPUs. This can result in performance that outshines that of many mainframes.



Novell Inc.

UnixWare 2.01

With UnixWare 2.01, Novell now has an operating system for deploying high-performance, reliable client/server applications. Designed as an application server to complement the file, print, and directory services provided by NetWare, UnixWare 2.01 combines easy installation, fast performance, good NetWare integration, and solid management tools to make it an excellent platform for your most demanding applications.

UnixWare, which supports multiprocessing in Version 2, was the fastest performer in our roundup. In our four-pro-

cessor ServerBench testing, UnixWare scored more than 20 percent above its nearest competitor at peak throughput loads with eight clients; as we increased the client load, UnixWare still performed about 5 percent to 10 percent better than the others. On a single processor, UnixWare ran about 15 percent faster across the entire client load than its nearest competitor, SCO OpenServer.

UnixWare 2.01's kernel and its subsystems are completely multithreaded, offering performance advantages over SCO OpenServer, which is based on an earlier version of the same System V Unix kernel. But you'll find fewer applications that have been written specifically for Unix-

Ware than for SCO OpenServer. Because they are based on the same kernel, you can run some SCO OpenServer applications using UnixWare's SCO-compatibility mode. UnixWare includes a C compiler, but a separate Software Development Kit (\$145) provides a full development environment, including programming utilities, debuggers, and documentation.

SETUP SIMPLICITY

Most Unix systems have the reputation of being hard to configure—and considering the multitude of hardware vendors in the PC industry, you might expect installing UnixWare to be a chore. But UnixWare met the task; the painless installation

tools, but that's where the similarities end. Informix, Oracle, and Sybase each takes their own proprietary approaches to stored procedures, triggers, and APIs. And each provides its own performance enhancements in the form of advanced database indexing and tuning mechanisms.

The big three DBMS vendors understand that NOS preferences change frequently, so all three provide consistent functionality across NOSs. In fact, end users and developers would hardly know the difference if you switched the database server NOS, as long as the database versions are consistent.

Nevertheless, database engines are very much dependent on the host NOS services. Only advanced 32-bit NOSs provide capable services to support the requirements of DBMSs. These services include multitasking, multi-processing, and multithreading.

For instance, DBMSs require a high level of concurrency support from the NOS to help them manage their simultaneous client connections and perform concurrent query processing.

Preemptive multitasking operating systems, like the NOSs reviewed for this feature, handle concurrency the best. With the support of the host NOS, some database engines can divide

queries into concurrently executing tasks, each assigned to one of a system's multiple processors.

The end result can be better-than-mainframe performance on commodity hardware. With threading, a DBMS can launch many lightweight processes from a single application that runs concurrently on single or multiple CPUs.

SERVER SYNERGY

Some DBMS vendors link their products with a limited number of operating systems. Lotus Notes, for example, runs on NetWare and Unix, but our testing has shown that you're likely to be better off running Notes on OS/2 or Windows NT.

The most notable alliances of DBMSs and NOSs come from NOS vendors that also sell DBMSs. For instance, Microsoft SQL Server 6.0 (descended from an earlier version of the Sybase DBMS) runs only on Microsoft Windows NT. Microsoft has rebuilt its database engine to get the most out of Windows NT—and has the benchmark test results to prove it.

Another example of this collusion is IBM's DB2/2 DBMS, which on x86 systems runs only on OS/2. DB2/2 is built from the ground up to make itself right at home in the OS/2 environment. Beyond the excellent product and NOS

integration, keep in mind that when you select a NOS and a DBMS in collusion, you're walking down the aisle with both products. You may find that in the future it will be difficult to migrate from your current NOS, DBMS, or both.

DON'T CROWD ME

Database engines are slowly taking over many operating systems' functions in the ongoing search for better DBMS performance. All of the big three, for example, set up their own proprietary disk partitions to enhance database-processing performance. Using this scheme, database engines eliminate the overhead needed to go through the file system of the NOS for file access, and instead go directly to the physical disk.

Database engine vendors are also working on other ways to circumvent the operating system overhead, including running the DBMS as a kernel-level process, and going directly to other subsystems such as memory, multiprocessors, and the network.

In fact, the best NOS for a DBMS right now may be the one that can get out of its way and allow the DBMS to take control of the system when necessary. To respond to this need, NOS vendors continue to work with DBMS vendors for even tighter NOS and DBMS integration.



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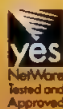
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process took just about an hour. The intuitive menu-driven interface led us through each step. We were always given clear default settings, but we also had the option of customizing hardware settings or adding other software modules.

Unlike SCO OpenServer, UnixWare supports a fairly extensive list of PC hardware, especially network adapters. A binary conversion utility can convert any NetWare ODI driver to let it work with

UnixWare. Still, while installation is fairly easy, UnixWare has neither Windows NT's auto-sensing features nor its very extensive hardware support.

SPRECHEN SIE NETWARE?

After the initial installation and configuration, we found some rough spots trying to get UnixWare to talk to our NetWare 3.12 server. UnixWare provides a software module called the NetWare Unix Client

(NUC) that lets you mount NetWare volumes on your UnixWare file system using NetWare's standard IPX protocol.

We first loaded the provided set of NetWare Loadable Modules (NLMs) on our NetWare server. These NLMs added the Network File System (NFS) namespace on NetWare volumes and handled discrepancies between NetWare- and Unix-based security schemes. Then we had to edit Unix-like configuration files

What About RISC?

By Don Crabb

With their exceptional combination of low pricing and RISC-like performance, Pentium-based systems have posed a serious challenge to RISC-based systems in the lower-end application server market. But thanks to significantly lower prices for RISC systems, to newer, faster RISC CPUs like the IBM PowerPC 604 and DEC Alpha 21164, and to symmetric multiprocessor (SMP) designs, RISC-based application servers are managing to hold their own.

The superior floating-point performance of RISC processors gives them a significant edge over the Pentium when running transaction-heavy client/server applications. For example, a catalog company that sells a large variety of customizable products requiring complex order forms filled

with calculated entries will find a RISC platform well-suited to its needs.

Aside from processing power, many RISC platforms also have proprietary I/O buses that are significantly faster than the x86's PCI and SCSI bus, and upgradable over time. And Unix has been the primary application server OS for RISC platforms a lot longer than it's been available for x86 servers. Application code for RISC platforms tends to be more mature when it comes to taking advantage of Unix's multiprocessing, multitasking, and multithreading features.

Now you can run Windows NT on many RISC platforms (Alpha, MIPS, and PowerPC), so you don't have to be a Unix expert to run a RISC server.

THE RISC MARKET

The major players in the RISC-based application server market are Digital Equipment Corp., Hewlett-Packard, IBM, and Sun Microsystems. Each offers systems with its own proprietary version of Unix.

Systems from all four vendors come in a number of multiple-processor configurations and hold impressive amounts of RAM, disk drive storage, and other internal add-ons—but at prices that are typically higher than those of Pentium-based application servers. The adjoining features table compares systems from four RISC vendors and one x86 vendor. We obtained this information by asking each RISC vendor to supply a configuration appropriate for an application server list-priced between \$35,000 and \$50,000. Keep in mind that many other configurations are available from all four vendors.

SUMMARY OF FEATURES RISC Servers

	Compaq ProLiant 4500 5/100, Model 4200A	DEC Alpha Server 2000 5/250	HP 9000 Series Model E55	IBM RISC System 6000, Model 58H	Sun Sparc Server 1000E
■ YES ● NO					
Products listed in alphabetical order					
List price	\$15,799	\$47,800	\$37,687	\$42,500	\$50,200
Processor	Pentium	Alpha AXP 21164	PA-RISC 7100LC	Power2	SuperSparc
Speed	100 MHz	250 MHz	96 MHz	55.5 MHz	60 MHz
Installed RAM	64MB	128MB	80MB	64MB	36K
Hard disks	Two 2GB	One 2GB	One 2GB	One GB	One 2GB
Expansion slots	8 EISA	7 EISA, 3 PCI	4 HP-PB	7 MCA	12 SBUS
Power supply	488W	400W	375W	475W	Info not available
RAID levels supported	0, 1, 4, 5	0, 1, 5	0, 1, 3, 5	0	0
Type of Unix supported	SCO Unix, UnixWare	Digital Unix	HP-UX	AIX	Solaris
Management utilities:					
Disk/account management	■ ■	■ ■	■ ■	■ ■	Optional Optional
Network management	■	Optional	■	■	Optional

DIGITAL ALPHA SERVERS

Earlier this year Digital released four new servers based on its Alpha AXP 21164 design. These included two enterprise servers, the Alpha Server 8200 and 8400, and two departmental servers, the Alpha Server 2000 and 2100. They are the first to use Digital's fast Alpha AXP 21164, running at 250 MHz for the 2000 series and 300 MHz for the 8000 series. Digital announced in July that it would upgrade the 2000 series to 300 MHz in late 1995.

All four servers offer OpenVMS and Digital Unix, previously called

Network Operating Systems

on NetWare manually to add UnixWare user and group information—a potentially time-consuming chore.

But the worst problem came once we got everything configured and tried to log on: We got a number of system hangs and inactivity time-outs on our UnixWare machine. The problem was fixed with a patch we downloaded from Novell's NetWare support database; the patch fixed all our problems and let us connect seamlessly.

OSF/1. Windows NT will also be available for all four models in the first quarter of 1996.

The Alpha Servers are a very cost-effective way to get top-notch RISC application server performance, and they work well in x86 environments. One problem with Digital, however, has been that Digital Unix lacks many advanced management features provided by IBM's AIX or Sun's Solaris.

HP PA-RISC

Using the Apollo-derived 32-bit PA-RISC CPU, Hewlett-Packard's 9000 Series Model 800s can be configured as file servers, application servers, communication servers, network servers, or combination servers. As part of that multiple-configuration capability, HP provides fault-tolerance support for its version of Unix, HP/UX 10.

These machines show performance almost equal to that of speedy Digital Alphas. Additional CPUs cost \$10,000 each and the systems can be upgraded to the 64-bit PA-8000 processor.

HP 9000s do a very good job of serving traditional client/server applications, like Oracle or Sybase. HP also prides itself on offering a number of connectivity and compatibility options to make the 9000s fit into an x86 desktop environment.

IBM POWER SERIES

IBM is starting to challenge Intel's Pentium price/performance formula with the Power Series, based on the PowerPC 604 processor. The new

Once we got NUC configured, we were able to log on to NetWare and browse files using either the graphical utilities provided or the Unix command line.

In spite of our initial problems configuring NUC, Novell has done a good job to help tighten integration between NetWare and UnixWare systems. For example, DOS and Windows clients can log on to UnixWare hosts using provided terminal emulation programs, which run over

servers are the first to be distributed by IBM through both its PowerPC and RS/6000 channels.

Power Series servers combine the components and architecture of the older PC Server with PowerPC engines. They cost half as much as the older entry-level RS/6000s and offer a dramatic improvement in performance. Compared with the performance of the Digital and HP systems described here, IBM's units come in third. IBM has targeted these app servers to take on Pentium systems running SCO Unix.

SUN SPARC SERVERS

Sun Microsystems' SPARC servers, which run either the SunOS or Solaris Unix, have simply not kept pace in terms of price or performance with offerings from Digital, HP, and IBM. The situation is starting to change, however, now that Sun sells SPARC-server 1000s with a number of multi-SPARC processor options, including CPUs rated at 60 MHz and higher. And Sun does offer some enticing applications, especially for Internet servers.

In the past six months, Sun has made a big push to be price- and performance-competitive with HP and IBM. Still, for x86 client shops, adopting SPARC servers can be a bit dicey, as Solaris and its supporting networking software have not earned major kudos from its customers for application compatibility among different Solaris versions (or with the older SunOS), not to mention ease of installation and maintenance.

standard NetWare client software. You will need to install them on each client workstation, however.

UnixWare also includes an MHS gateway to NetWare that lets UnixWare clients exchange mail messages with Net-

*Unlike OpenServer,
UnixWare supports
a fairly extensive list
of PC hardware,
especially network
adapters.*

Ware MHS users. A Target Service Agent (TSA) lets you back up UnixWare data using Novell's Storage Management Services (SMS) architecture. NetWare 4.1 shops, however, won't get any integration with NetWare Directory Services (NDS) in UnixWare; those capabilities are planned for a future release.

SERVER SAFETY

To ensure higher levels of fault tolerance, UnixWare provides the Veritas journal-

► FACT FILE

UnixWare 2.01

List price: Application Server (2 processors, unlimited concurrent users), \$1,695; each additional processor, \$885. **Requires:** 386-based PC or better, 16MB RAM, 160MB hard disk space, CD-ROM or QIC-120 drive.

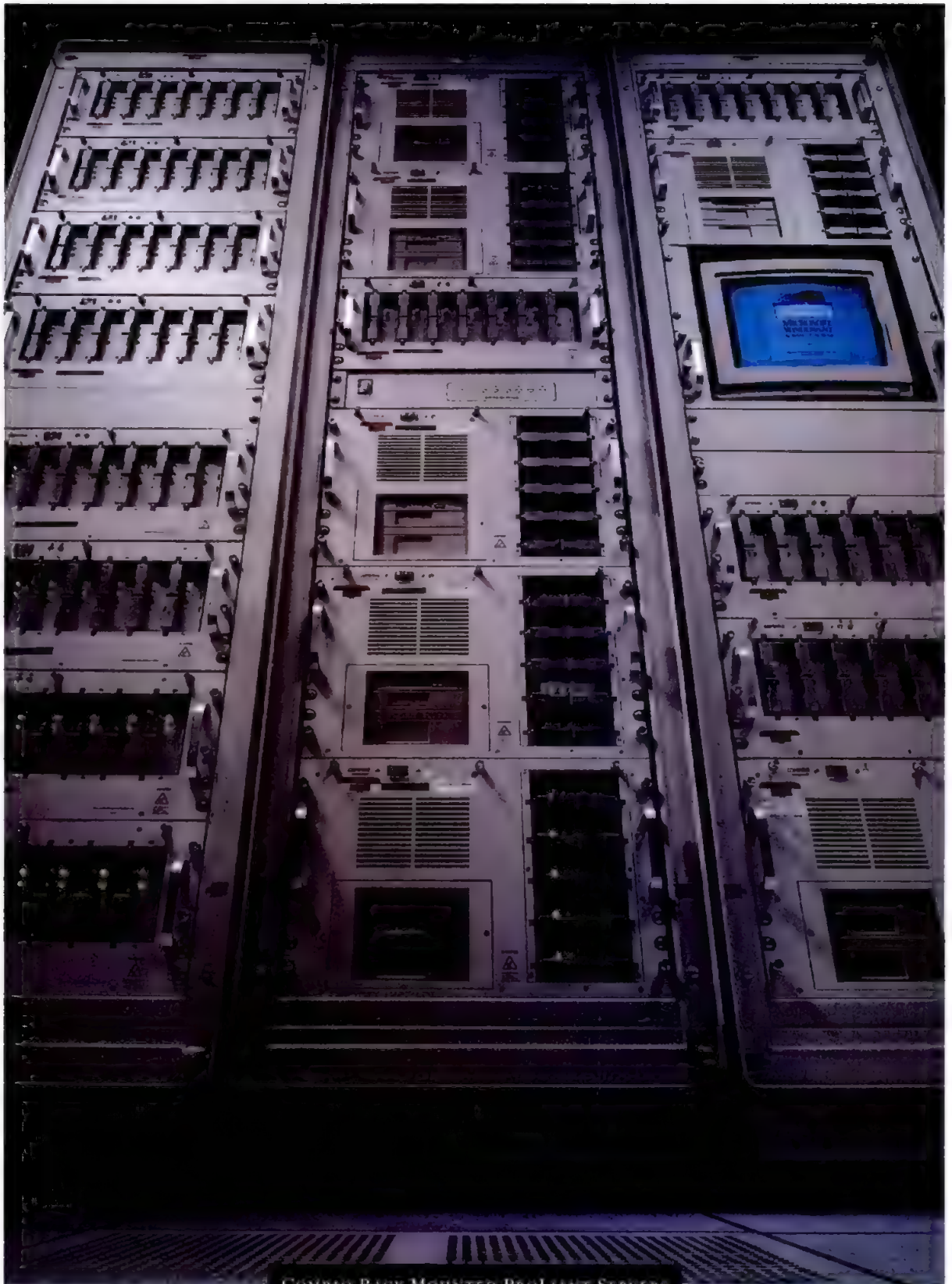
In short: We liked UnixWare's combination of easy installation, good NetWare integration, solid management tools, and excellent performance; it was the clear leader in multiprocessor performance testing. The GUI was easy to use and more sophisticated than SCO OpenServer's interface. Although we had a few initial problems connecting UnixWare to our NetWare server, overall we think it's a very good platform to house business applications. As more applications arrive specific to the platform and Novell adds support for NDS to the product, UnixWare may become the most logical fit for NetWare environments.

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The Compaq logo, featuring the word "COMPAQ" in a bold, italicized, sans-serif font. The letters are red with a black outline, and the entire logo is set against a white background with a subtle shadow effect.

ing file system. Like SCO's implementation, UnixWare's journaling helps minimize downtime in the event of a power failure by logging file-system changes to the disk as they occur.

However, UnixWare does not integrate with any UPSs. On our tests, when we pulled the plug on the UnixWare server and then plugged it back in, the system recovered in about 1 minute. UnixWare also lets you create Emergency Recovery floppy disks to help you recover your system in case the operating system gets corrupted.

Unlike Windows NT, however, UnixWare does not provide any disk management tools out of the box. A separate product from Novell, the Online Data Manager, lets you perform software-based disk striping (RAID level 0) and disk mirroring (RAID level 1). ODM costs \$2,195 per server; Microsoft Windows NT Server includes RAID levels 0, 1, and 5 in the base price.

We found the management tools pro-

vided with UnixWare full-featured and easy to use. The utilities do a good job of shielding you from the intricacies of the Unix command line. The Internet Setup utility, for example, lets you configure all your TCP/IP-related parameters using a single graphical window. If you're a Unix expert you can configure the system using the command line as well, and at times it is either convenient or necessary to revert to a command line interface.



UnixWare includes several useful management tools such as System Monitor, shown graphing CPU utilization.

UnixWare's System Monitor tracks system parameters such as CPU idle time, system swaps, and free memory pages. System Monitor graphs these statistics in real time, and you can save results to a file and then play them back later. Unix-based command-line utilities, such as *sar* (system activity reporter), are also available for Unix experts, but they are considerably more difficult to use.

Overall, UnixWare is especially well suited for NetWare administrators who plan to integrate Unix-based client/server application services into their networks. Compared with SCO OpenServer, UnixWare had better performance and was easier to install. Although full NetWare integration—especially NDS integration—isn't there yet, the combination of blazing performance, easy installation, strong management utilities, and good NetWare support makes it a solid choice to house business-critical applications.

—John Garriss □

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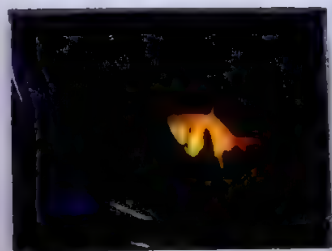
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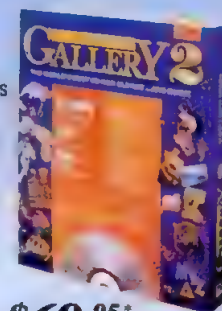
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PC Tech

THE DEFINITIVE GUIDE TO PC TECHNOLOGIES & TOOLS

Make the Most of PowerBuilder

Four full-featured add-ons that streamline your client/server development.

By Brian Butler and Mark Childers

A quick glance at the help-wanted ads will attest to the popularity of Powersoft's PowerBuilder 4.0: Programmers versed in this object-oriented client/server development environment can take their pick of jobs. This popularity, and PowerBuilder's open environment, have spawned a market for third-party add-on tools that make developing in PowerBuilder simpler and more full-featured. The aftermarket of specialized add-on tools has enabled PowerBuilder to make the transition from a mere product to a platform, comparable to Visual Basic and its VBX controls.

We looked at four of the most popular PowerBuilder toolkits: Greenbrier & Russel's ObjectStart, MetaSolv Software's PowerFrame, PowerCerv Corp.'s PowerTOOL, and ServerLogic Corp.'s PowerClass/PowerObject/PowerLock. All these tools are geared toward speeding development and creating a more polished and easier-to-maintain application.

Although PowerBuilder alone is a substantial development environment, we found



FOUR RICH ADD-ONS that help elevate PowerBuilder from product to platform: ObjectStart, PowerFrame, PowerTOOL, and PowerClass/PowerObject/PowerLock. All offer an application framework, application-level security, and custom widgets.

Icons by Hugh Whyte

IN THIS SECTION



TUTOR What is the difference between RISC and CISC microprocessors? Jeff Prosis examines the baggage these terms have collected and looks at the real chips that bear these monikers. His conclusion: RISC and CISC chips are different—but not always in the way the names imply. *page 247*



INSIDE WINDOWS 95 The Windows 95 Registry is arcane and underdocumented. It's also the key to a host of powerful customizations you can make to the Windows 95 environment. In the first of a three-part series, we look inside the Registry and explore some sample desktop customizations. *page 251*



POWER PROGRAMMING World-Wide Web publishing is evolving at breakneck speed, and developments to the Hypertext Markup Language (HTML) are one of its most important driving forces. Ray Duncan looks at the powerful new table-encoding features supported in Version 3.0, HTML's latest incarnation. *page 255*



INTERNET WORKING How many times have you found a file on the Web that your browser couldn't open without an add-on utility? Java and HotJava, now under development at Sun Microsystems, promise a Web where both the file and the tools to use it are accessed together. The object-oriented Java language will be familiar to C++ developers. *page 265*



UTILITIES Millions use the Windows 3.1 macro recorder despite a major flaw: It won't let you edit your macros. Make a mistake and you'll have to start from scratch. RecEdit, this issue's utility, finally lets you edit your Windows .REC macro files. It even lets you cut and paste between .REC files. *page 269*

ALSO IN THIS ISSUE PC Solutions looks at how to move TrueType fonts, which side of a CD-ROM is the worse one to scratch, and how to set up OS/2 Warp and Windows 95 for dual-booting on the same system. *page 287*



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three major areas where these third-party packages fill a need: application frameworks, security features, and custom objects.

APPLICATION FRAMEWORKS

To develop applications for an enterprise, you should take advantage of PowerBuilder's object-oriented nature. You do this by developing a cohesive hierarchical structure of classes, typically referred to as a *framework*, on which you'll build applications. This framework consists of base classes to provide the needed common functionality. The advantage of this approach is that code is reused, minimized, and centralized, yielding applications that are easier to design, implement, maintain, and extend.

Since the framework is the foundation of the application, it must be carefully planned and executed. While a framework can greatly increase productivity, a price is paid in effort spent developing your own. It's a time-intensive, error-prone task, often requiring many rewrites. Thus, what was supposed to be a time-saver quickly turns into a burden. An in-house framework, however, can help you avoid much of the baggage associated with the larger, third-party frameworks reviewed here.

The Application Library included with PowerBuilder Enterprise Client/Server Development Tool is a good starting point for developing your own framework. But be warned: Using Application Library is a lot like using a template. It's a good starting place, but it's a far cry from a complete framework. The Application Library lacks a hierarchical

class structure and many of the underlying common classes needed to develop a robust framework for your applications. In addition, it's also missing facilities for centralized message-handling and error-logging.

At first glance, all the frameworks we reviewed seemed overwhelmingly complex and expensive. But after spending some time with the products, we began to see an increase in both productivity and reliability of code. The tight coding styles and consistent methodologies, along with the sample source code each tool provided, will give you great insight into how a PowerBuilder application should be written. All the products provided well-written documentation, with good tutorials and complete user guides, as well as full class references. In particular, we found ServerLogic's documentation very complete, although it lacked a hierarchical class diagram.

Some of the frameworks take you a few steps further. For instance, ObjectStart from Greenbrier & Russel provides an application-generation program that builds the initial .PBL file for you using a wizardlike interface, which even lets you create menus and windows (see Figure 1). PowerBuilder's application generator is pretty deficient by comparison. PowerClass and PowerFrame enhance the query-by-example process for DataWindows. This can be very useful for those who can't figure out how to use the PowerBuilder DataWindow filter window, which can be too complicated for some users. PowerFrame also gives you a window object for maintaining intersection tables (see Figure 2).

All the frameworks provide similar features and functionality, yet the methodology and implementation are somewhat different in each. ObjectStart stands out from the rest because of its nonvisual objects, and it's the only framework that centralizes event processing for the window in one script. While centralizing event processing can ease support and maintenance, it makes overriding and extending the script in descendant objects more difficult.

We found that the frameworks ranged from deep class hierarchies to flat ones, based on the level of inheritance that is possible. PowerClass, PowerFrame, and PowerTOOL can be classified as flat in their hierarchy approaches, since they minimize the levels of inheritance within the framework structure. ObjectStart's hierarchy contains many levels of inheritance, giving it a deep class hierarchy. Both approaches can be desirable, depending on how many of your own levels of inheritance you want to add, the required functionality, and the granularity of inheritance you desire. Although very deep levels of inheritance make for good object-oriented design, they result in slower initial window instantiation.

In general, getting started with all four products was not that difficult. All that is necessary is to set up your application object and then start creating your application windows, inheriting windows with the desired functionality from the class library.

Each product has some method for maintaining and setting up global attributes and defaults used by the class library. PowerClass,

POWERBUILDER ADD-ONS: AT A GLANCE

	Application framework	Security	Object library
ObjectStart	Wizard-like application generator; nonvisual user objects; centralized event processing; deep class hierarchy; centralized message and error handling, but no logging.	Limited security management, with granularity only down to the window level.	Tabbed dialog object uses separate windows (preferred); powerful outline window object lets you customize displayed bitmap and define static outlines; includes calculator, calendar, and percent-complete bar objects.
PowerClass, PowerLock, and PowerObject	Enhances QBE process for DataWindows; flat hierarchy; enhanced concurrency control; user can set up drill-down relationships for DataWindows.	Strong security management, with granularity down to the individual control; automates loading objects into the security database; secures each DataWindow separately.	Tabbed dialog object hides and unhides DataWindows within a single window; very powerful outline object provides visual cues to signify whether a level can be expanded and supports drag-and-drop; includes pop-up calendar and percent-complete bar objects.
PowerFrame	Enhances QBE process for DataWindows; window object maintains intersection tables; flat hierarchy; error and message handling and logging.	Strong security management, with granularity down to the individual control; automates loading objects into the security database; secures at the column level of the underlying database.	Tabbed dialog object hides and unhides DataWindows within a single window; user can customize displayed bitmap; outline object requires more coding but is more powerful than others; includes calculator, calendar, and percent-complete bar objects.
PowerTOOL	Flat class hierarchy; error and message handling and logging; data-driven application navigator.	Limited security management, with granularity only down to the window level	Tabbed dialog object hides and unhides DataWindows within a single window; outline view is not data-driven and requires additional setup; displayed bitmap cannot be customized; includes calendar and percent-complete bar objects.

for instance, requires you to set up and initialize a global structure in the application object. PowerFrame and PowerTOOL require you to instantiate a nonvisual user object in the application object. This is used by all subsequent windows inherited from the class library. ObjectStart makes this task a little easier by automating it with its application generator.

Each library has a lot of code behind it defining the default behavior of the windows and DataWindows. The hardest part of mastering these libraries is learning how to manipulate this behavior. Generally the default behavior will work fine, but there will always be times when you want something different. For instance, if you were trying to set up a master list/detail edit-style window in PowerClass, but wanted to allow a new record to be added to the detail only (the default is to allow new records on both the master and detail DataWindows), you automatically think of overriding the script that issues the

all the security will be enforced by the back end. But as they move further along the development cycle, they quickly realize that PowerBuilder provides no native application security and no inherent knowledge of the security enforced by the back end.

For an application to be successful, the client application and back-end database must appear to be one. A separation of the two gives

AN INTUITIVE *DataWindow class simplifies entering and managing intersection tables.*

the impression that an app isn't well thought out and at times leads to false bug reports. Case: A user editing records decides to do a save but is greeted with the message "Database Error: Insufficient Privileges." While the database administrator can be sure that the back-end database is protecting the data, cryptic messages and loss of work often make for an irate end user. Furthermore, a user may interpret these messages as bugs within the application and quickly report them. A more desirable approach is to prevent

the user from seeing the screen in the first place by graying out fields that are not editable and hiding confidential data. All this requires coding in PowerBuilder. All the products discussed here provide tools to manage and implement application security. In addition, they provide source code that allows you to adapt the libraries to individual security requirements.

Of the tools reviewed, PowerLock and PowerFrame offer stronger security management, while ObjectStart and PowerTOOL are limited in this department (see Figures 4, 5, and 6). The latter two provide security granularity only down to the window level. In contrast, we found PowerLock and PowerFrame administration tools to be full-featured and robust. They provide developers with excel-

POWERFRAME provides standard toolbars to navigate through your application.

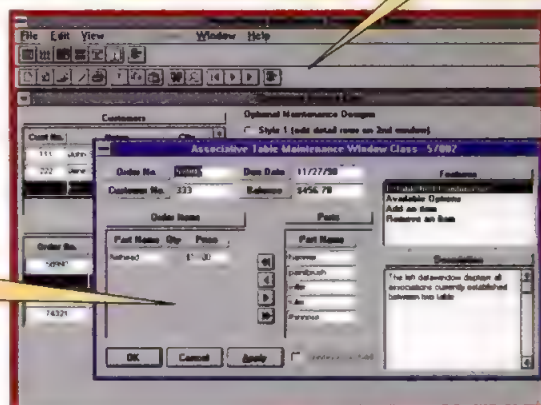


FIGURE 2: PowerFrame's application framework module.

lent management tools and security granularity down to the individual control and at the data column level within a DataWindow.

Before you can grant or revoke security, you must identify the items to be secured and place them into a database. Identifying the objects in your app that require security is a tedious task at best. Thankfully, both PowerLock and PowerFrame offer administration tools that automate the process of loading application objects into the security database.

To populate the security database, you just run your PowerBuilder application, and when a screen requiring security is displayed, launch an included utility. You will see a list of all the objects on the window, including the DataWindows and columns. Just select all or any of the objects you want to secure and they will be added to the security database. Once you have created the security database, assigning security is a simple matter of using point-and-click administration tools.

One key difference between PowerLock

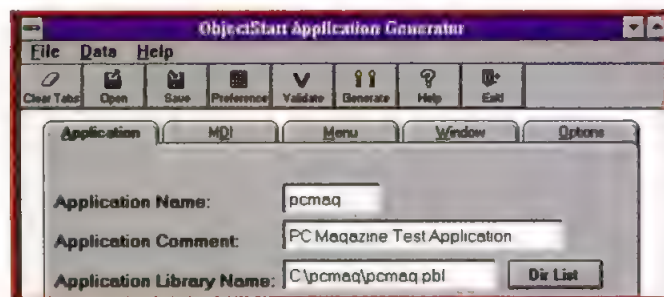


FIGURE 1: ObjectStart lets you generate your application skeleton and defaults, using a tabbed dialog interface.

InsertRow() command. But actually all you need to do is use the PowerClass function

```
<datawindow>.Set_DW_Options(...)
```

during the window's open event with the control word that prevents inserts. It is actually very easy once you figure out all the control flags ServerLogic has added to control the way a window or DataWindow operates.

PowerFrame and PowerTOOL have added the error- and message-handling and logging that are missing in Powersoft's Application Library. ObjectStart also provides centralized error- and message-handling but no logging. PowerClass provides the developer with enhanced concurrency control and allows you to set up the drill-down relationships for DataWindows (see Figure 3). PowerTOOL also offers a data-driven application navigator to facilitate moving around the application without using the standard Windows menu.

SECURITY LIBRARIES

Application security is an issue that all developers of PowerBuilder enterprise applications eventually have to tackle. During the initial phases of a project, developers often ignore application security, naively thinking

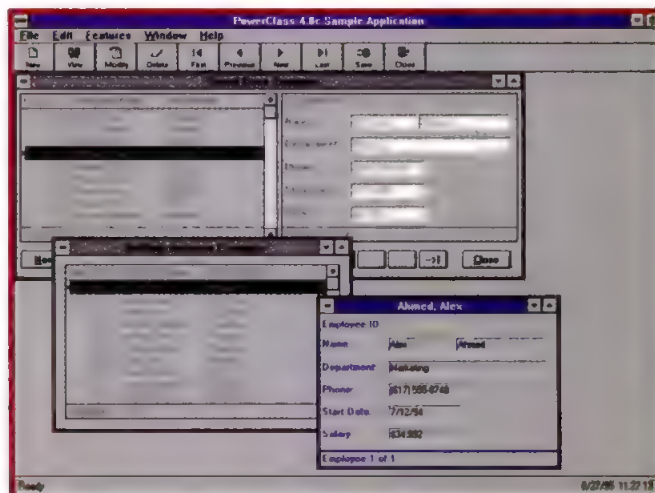


FIGURE 3: PowerClass manages drill-down relationships; windows above the current drill-down level are automatically grayed out.

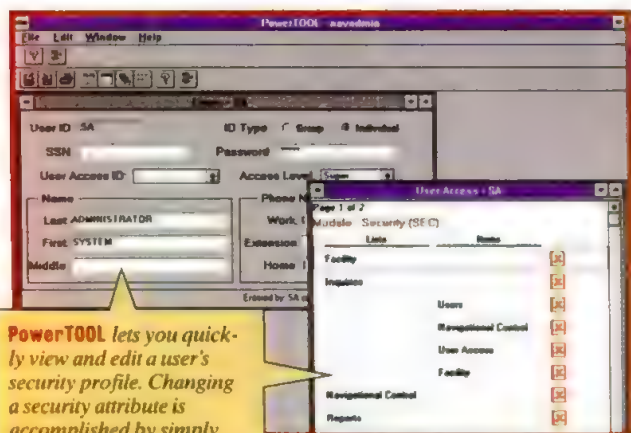


FIGURE 4

and PowerFrame is their approach to securing a column in the DataWindow. PowerLock secures by DataWindow, so every DataWindow that needs to be secured will have to be added to the database. PowerFrame assigns security by column, based on the underlying database table. Once a column is flagged as secured, that column will be secured for all DataWindows in which it appears.

OBJECT LIBRARIES

PowerBuilder provides developers with a toolbox of all the standard Windows controls. But even with the toolbox's wealth of controls, developers are always seeking more widgets to add to their arsenals. While security libraries and frameworks are a must for any PowerBuilder developer, object libraries are window trimmings: They give the app an appearance of polish and professionalism.

All four object libraries have versions of the Tabbed Dialog box, a new dialog style that is standard in Windows 95. PowerFrame, PowerObject, and PowerTOOL all implement the Tabbed Dialog by automatically hiding and unhiding various DataWindows associated on a single window. ObjectStart's implementation is similar to MFC (Microsoft Foundation Classes) in that sev-

eral separate windows are tied together to create a single tab dialog. While all the products provide the needed functionality, we found ObjectStart's approach more natural. It also lets you quickly migrate existing windows to a tab control.

Another custom object present in each product is an outline window that presents data as you see it in File Manager's tree view. Both PowerObject and ObjectStart build the outline view by assigning

each level to a database table. This method requires each sublevel to have a primary/foreign key relationship with the parent. ObjectStart also allows you to define a static outline that is not tied to any data.

PowerTOOL's outline view is not data-driven and requires additional setup, forcing the developer to define a specific database table for the sole purpose of defining the outline structure. PowerFrame uses a slightly different method, in which you define DataWindows for the different levels. This method probably requires a little more coding than the others, but it offers the most flexibility in the items shown on the outline object. All but PowerTOOL's outline object let you customize the bitmap displayed. PowerObject's outliner gives you visual cues to signify whether a level can be expanded, and it also fully supports drag-and-drop. PowerObject and PowerFrame have the most powerful outline objects.

Other custom objects provided in the object libraries are a pop-up calculator (found in PowerFrame and ObjectStart), which can make entering numeric data easier; a pop-up calendar object (PowerFrame, ObjectStart, PowerObject, and PowerTOOL), for entering date-related data; and a percent-complete bar graph (all four).

All the products ex-

amined here will greatly reduce the amount of coding required to implement an enterprise client/server application. And all enhance the already-rich PowerBuilder development environment. Though ObjectStart and PowerTOOL are well-rounded toolkits, both MetaSolv's PowerFrame and ServerLogic's PowerClass/PowerObject/PowerLock combination are more comprehensive. □

ObjectStart. List price: Single user, \$895; single user plus a year of product maintenance and tech support, \$1,250; five-developer pack plus a year of maintenance and tech support, \$4,975. Greenbrier & Russel, Schaumburg, IL; 800-453-0347, 708-706-4000; fax, 708-706-4020.

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PowerClass. List price: Network server license, \$2,995; standalone license, \$995; desktop license, \$495. **PowerLock.** List price: Development network server license, \$1,995; production network server license, \$395. **PowerObject.**

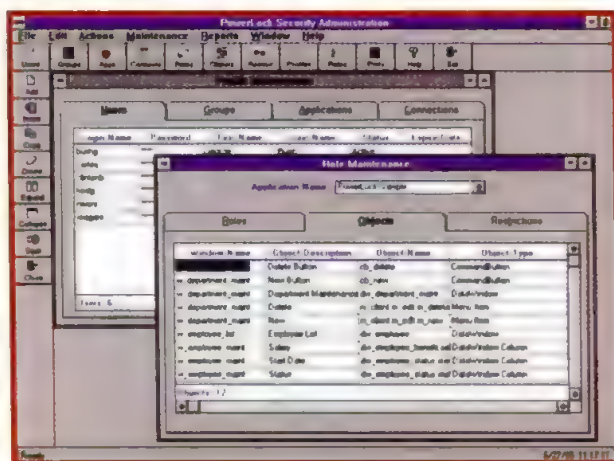


FIGURE 5: With PowerLock's Tab-dialog metaphor, maintaining security is a breeze. It lets you define security down to the DataWindow level.

List price: Server license, \$895 (per module); standalone license, \$395 (per module). (Data navigation, data management, and application utility modules sold separately.) ServerLogic Corp., Bellevue, WA; 206-803-0378; fax, 206-803-0349.

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PowerFrame. List price: Application Framework Library: \$395 (per developer); site license, \$13,825; Application Security Library: \$1,495 (per production server), site license, \$5,232; TabFolder Object, Navigator Object, or Object Analyzer utility: \$129 (per developer); site license, \$950; unlimited site license, \$2,850. MetaSolv Software, Dallas, TX; 214-239-0623; fax, 214-239-0653.

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PowerTOOL, Version 4.0. List price: \$1,200 (per developer; add 15 percent for maintenance, tech support, and updates). PowerCerv Corp., Tampa, FL; 813-226-2378; fax, 813-222-0886.

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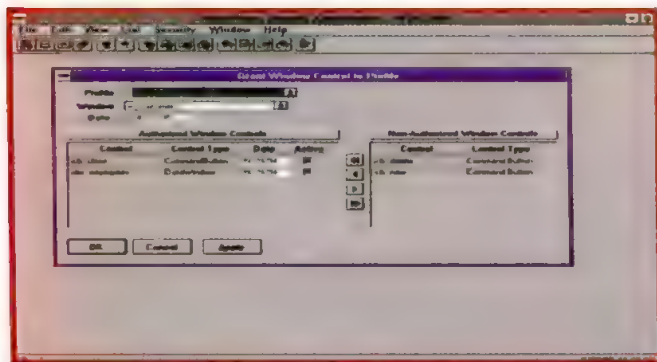


FIGURE 6: PowerFrame provides a security interface consistent with its application framework's intersection table maintenance, letting you easily administer security profiles.

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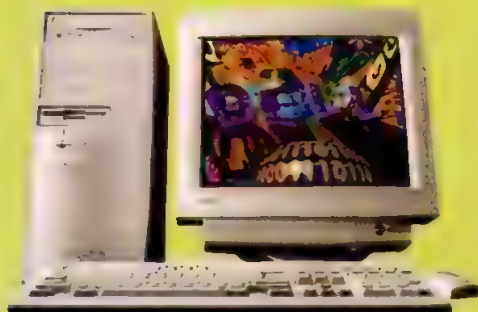
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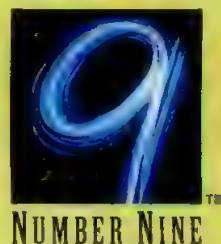
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CIRCLE 259 ON READER SERVICE CARD



By Jeff Prosize

RISC vs. CISC: The Real Story

What makes the PowerPC a RISC processor and the Pentium a CISC?

The recent emergence of PowerPC-based computers as serious contenders in a marketplace dominated by Intel has stoked the fires of a great debate. Which is better: RISC (reduced instruction-set computing) or CISC (complex instruction-set computing)? RISC backers contend that their chips run faster and are generally more powerful than CISC chips, but Intel and other CISC proponents adamantly oppose this view.

What's missing from the debate is a discussion of the actual differences between RISC and CISC chips. *Reduced instruction set* would seem to imply that RISC processors support fewer instructions than their CISC counterparts. But is this really the case? And if it is, wouldn't that mean that a RISC processor runs software more slowly, since it has to execute more instructions to carry out complex tasks such as recalculating cells in a large spreadsheet or drawing a graphical image on-screen? What, if anything, is the advantage of a smaller instruction set? And just what is an instruction set, anyway?

In the interest of a more informed debate, the following discussion seeks to answer these questions and outline exactly what it is that makes a processor RISC or CISC. If you don't know the answer already, the truth may surprise you.

RISC: THE MYTH

The first time I heard the term RISC, it was explained to me like this: By reducing the number of instructions that a CPU supports and thereby reducing the complexity of the chip, it's possible to make individual instructions execute faster and achieve a net gain in performance even though more instructions might be required to accomplish a task.

Okay, I thought, sounds plausible. An *instruction* is a command encoded in 1s and 0s that makes a microprocessor do something. When a developer writes a program in C or C++ or some other high-level language, the compiler translates each statement into one or more microprocessor instructions. So that programmers who want to see these microprocessor instructions don't have to wallow in 1s and 0s, the instructions are represented with mnemonics—for example,

`mov`, which moves a value from one location to another, and `add`, which adds two values together. The following statement adds two integer variables named *b* and *c* and then stores the result in *a*:

`a = b + c;`

A C compiler might translate this statement into the following sequence of instructions:

```
mov    ax,[VariableB]
add    ax,[VariableC]
mov    [VariableA],ax
```

The first instruction copies the contents of the memory location that holds the value of *b* into the microprocessor's AX register. (A register is a storage location inside the microprocessor that holds a small amount of data, usually 16 or 32 bits, just like a memory location. Because registers are a part of the microprocessor, register accesses are much faster than memory accesses.) The second

Modern application programs often contain hundreds of thousands of lines of code. Operating systems are even more complex: Microsoft Windows 95 contains about 10 million lines, most of it written in C, and Windows NT contains more than 5 million lines written in C and C++. Imagine translating a million lines of C code into a set of instructions from 1 to perhaps 20 or 30 instructions each, and it's easy to see why software today is so complicated—and so difficult to debug. But we digress.

When a program runs, the microprocessor reads, or *fetches*, the instructions one by one and executes them. It takes time to fetch an instruction and more time to decode that instruction to determine what the 1s and 0s represent. And once the instruction begins executing, it takes a certain number of clock cycles to run to completion. A clock cycle is one beat of the oscillator that drives the microprocessor. On a 25-MHz 386, 1 clock cycle (or simply *clock*) is equal to 40 billionths of a second, or 40 nanoseconds. For a 120-MHz Pentium, 1 clock is less than 9 nano-

seconds. One way to make a microprocessor run software faster is to increase the clock speed. Another way is to decrease the number of clocks required to execute an instruction. Everything else being equal, a 100-MHz microprocessor will deliver only half the performance of a 50-MHz microprocessor if the former requires 4 clocks per instruction but the latter requires just 1. Traditionally, CISC microprocessors like the x86 have required anywhere from 1 to more than 100 clocks to complete an in-

struction. For example, the `mul` (multiply) instruction on the 8088 that powered the original IBM PC required up to 133 clocks to multiply two 16-bit integers. A register-to-register `mov`, by contrast, required only 2 clocks. The same multiply on a 486 requires as few as 13 clocks, and `mov` requires just 1.

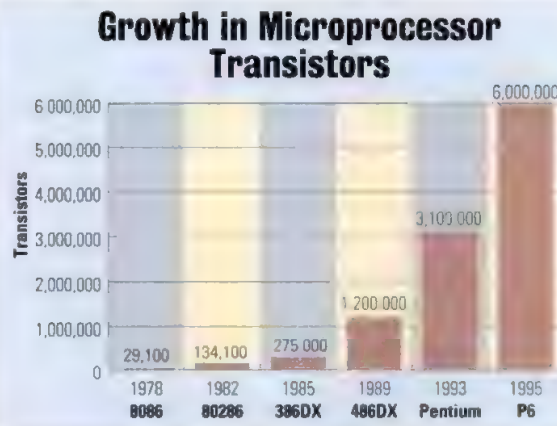


FIGURE 1: Transistor counts have blossomed since the inception of Intel's 8086 family of microprocessors.

instruction adds the value of *c* to the contents of AX, and the third copies the result, which is in AX, to the memory location where the *a* variable is stored. Any program, no matter how complex, ultimately translates into bite-size series of instructions like this one.

That's one reason you can't compare, say, a 25-MHz 386 with a 120-MHz Pentium based on clock speeds alone. The instruction timings are different, and with each successive generation of the x86, Intel has reduced the clock counts for individual instructions.

What does this have to do with RISC? Since the dawn of the microprocessor age, the holy grail for chip designers has been to develop a CPU that requires 1 clock cycle per instruction—not just certain instructions, but *every* instruction. Given an unlimited number of transistors to work with, a microprocessor can be made into a 1-clock-per-instruction device. But the transistors on a CPU have to fit into a limited amount of real estate, so transistor counts are limited. RISC's original goal was to limit the number of instructions on the chip so that each could be allocated enough transistors to make it execute in one clock cycle. Rather than provide a `mul` instruction, for example, the microprocessor's designers might make sure that `add` executes in one clock. Then a compiler could multiply *a* and *b* by adding *a* to itself *b* times or *b* to itself *a* times. A CISC CPU could multiply 5 by 10 like this:

```
mov    ax,10
mov    bx,5
mul    bx
```

But a RISC chip might do it like this:

```
mov    ax,0
mov    bx,10
mov    cx,5
Begin:
add    ax,bx
loop   Begin    ;loop cx times
```

This is admittedly a contrived example (modern RISC chips *do* have multiply instructions), but it's illustrative nonetheless. The RISC version uses more instructions, but if the instruction timings are low enough, the RISC chip might do in 20 clocks what the CISC chip requires 100 clocks to do. Given a finite number of transistors to work with, there's a trade-off between instruction-set complexity and instruction timing. RISC seeks to strike a better balance between the two to produce a faster microprocessor. The transistors a RISC chip saves on large instructions can be used for cache, pipelines (more about these in a moment), and more registers.

At least that's the theory. There's just one small problem: If you check the technical manuals, you'll find that today's RISC chips often have richer and more complex instruction sets than CISC chips. The PowerPC 601, for example, supports *more* instructions than the Pentium. Yet the 601 is considered a RISC chip, while the Pentium is definitely CISC. So what does RISC *really* mean? And what distinguishes a RISC chip like the PowerPC 601 from a CISC chip like the Pentium? Ironically, the answer has nothing to do with the size of the instruction set.

RISC: THE REALITY

In reality, there's nothing RISC about a lot of RISC chips any more—that is, their instruction sets aren't really reduced. The first RISC computer was developed by IBM in the mid-seventies. Since that time, the number of transistors that chip manufacturers can pack onto a silicon wafer has steadily increased. A Pentium contains more than 3 million transistors in an area that is roughly a half-inch square (see Figure 1). The sheer num-

ber of transistors, combined with architectural improvements to the chip itself, allows a Pentium to execute two instructions per clock cycle.

The Pentium doesn't actually perform an instruction in half a clock cycle; many instructions still require multiple clocks. But a technique called *pipelining* allows instructions to be overlapped, so that five instructions each requiring 5 clock cycles can be completed in a total of 5 clocks—an average of one instruction per clock. (For more on pipelining, refer to the sidebar "Pipelining: How It Works.") And the Pentium's two independent execution units, which qualify the Pentium as a *superscalar* microprocessor, permit two pipelines to run in parallel.

So much for cutting out instructions to make the remaining ones faster. With today's transistor budgets (a chip designer's term for the number of transistors allotted for use), it seems that *all* chips average 1 clock or less per instruction, no matter how complex their instruction sets.

What really distinguishes RISC from CISC these days is more deeply rooted in the chip architectures. In their book *Inside the PowerPC Revolution* (1994, Coriolis Group), which presents a lucid analysis of RISC and the PowerPC architecture in particular, Jeff Duntemann and Ron Pronk point out several key traits that characterize today's RISC designs. Among them:

- RISC microprocessors have more general-purpose registers. The best way to write fast code is to maximize the number of operations performed "on-chip" and minimize the number of accesses to data stored in memory. More registers make this goal more attainable. Register accesses are nearly instantan-

Pipelining: How It Works

Pipelining is a technique used by RISC and CISC microprocessors to break the execution of individual instructions into stages and overlap the stages so several instructions can be processed in parallel. Both 486 and Pentium CPUs use the five-stage pipeline diagrammed in Figure A. The values in the boxes represent instructions—I1 for instruction number 1, I2 for instruction number 2, and so on. The five stages of the pipeline are:

- PF, which fetches an instruction from the processor cache or memory;
- D1, which decodes the instruction;
- D2, which generates a memory address if the instruction includes a memory reference;
- EX, which executes the instruction; and

- WB, which stores, or "writes back," the result.

Under ideal conditions, each stage requires 1 clock cycle. You can trace the path that a single instruction takes through the pipeline by following I1 from start to finish. During the first clock cycle, I1 is fetched. During the second clock cycle, it is decoded. I2, meanwhile, is being fetched. After 5 clock cycles, processing of I1 is complete. When the pipeline is fully loaded, an average of one instruction per clock cycle can be output from the pipeline, like cars rolling off an assembly line. The Pentium's superscalar design incorporating two independent pipelines nominally doubles the processor's instruction throughput.

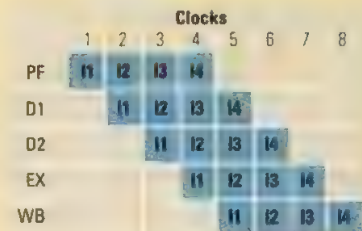


FIGURE A: Pipelining allows more than one microprocessor instruction to be serviced at once. Time moves from left to right in units of a clock cycle. Follow the first instruction, I1, from left to right, and you can see that other operations enter the pipeline before I1 is finished. This allows the microprocessor to average 1 clock cycle for each instruction.

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neous; memory accesses take time. A Pentium has just eight general-purpose registers, but a PowerPC chip has 32.

- RISC microprocessors use load/store architectures. CPU instructions that operate on data in memory—for example, integer add instructions that add x to y , where y is a value stored in memory—are among the most expensive in terms of clock cycles. In addition, the implementation of these instructions tends to require a disproportionate number of transistors. RISC designs minimize the number of instructions that access memory in favor of load/store architectures that require y to be loaded into a register before x is added, then “stored” back to memory.

- RISC microprocessors use uniform instruction lengths. On a Pentium, the length of one instruction can vary from as little as 1 byte to as many as 7 (more if 32-bit code is executed in a 16-bit segment). RISC designers, on the other hand, favor making all instructions the same length—usually 32 bits. This simplifies the instruction-fetching and decoding logic and also means an entire instruction can be retrieved with one 32-bit memory access.

- RISC microprocessors emphasize floating-point performance. Traditionally, the stronghold of RISC machines has been the scientific community, whose applications do more

floating-point math than a typical word processor or spreadsheet. Therefore, RISC microprocessors nearly always have high-performance floating-point units built in. Only recently, with the Pentium, has an entire line of Intel chips included a math coprocessor (remember the 486SX?), and integer operations are still considered the Pentium’s mainstay.

In general, RISC designers have been quick to adopt cutting-edge technologies such as on-chip code and data caches, superscalar designs, instruction pipelining, and branch prediction logic—anything to give their chips a performance boost. But Intel has incorporated the same technologies, so it’s difficult to distinguish RISC from CISC on the basis of those features. There are some RISC chips that stay closer to the original intent of RISC. For example, Digital’s Alpha and the MIPS RX000 family combine reduced instruction sets with huge internal caches and Olympian clock speeds of 200 MHz and higher.

Chip makers such as AMD, Cyrix, and NexGen are further blurring the line between CISC and RISC by incorporating RISC-like features into their Pentium clones. Internally, for example, NexGen’s Nx586 and AMD’s K5 use instructions that are all the same length—as does Intel’s own impending

P6 chip. The internal instruction sets employ load/store architectures that limit the number of instructions that perform memory accesses.

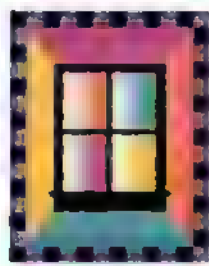
The NexGen and AMD chips also address the Pentium’s limited register availability (which adversely affects the chip’s ability to execute instructions concurrently in its two pipelines) by implementing 22 and 40 registers, respectively. So that existing software written for the x86 has access to all the registers, the chips use a sophisticated *register renaming* scheme to dynamically map the “visible” registers to other members of the register set. For more on register renaming, branch prediction, and other advances in the architecture of Pentium-class microprocessors, see “What’s Next Inside?” and “Inside the Chips” in our issue of February 21, 1995.

THE BOTTOM LINE

The difference between RISC and CISC microprocessors is no longer one of instruction sets, but of chip architectures. The designations RISC and CISC are no longer meaningful in the original sense; what counts is how fast a chip can execute the instructions it is given and how well it runs existing software. These days, both RISC and CISC manufacturers are pulling out all the stops to get an edge on the competition. □

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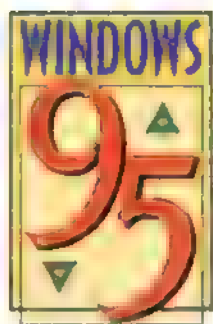


PC Tech/Inside Windows 95

By Barry Simon

The Windows 95 Registry, Part 1

A unified database replaces Windows 3.x configuration files.



In the beginning, Windows used only two system configuration files: CONFIG.SYS and AUTOEXEC.BAT. That number doubled with the advent of WIN.INI and SYSTEM.INI in Windows 2.x, then expanded to unruly proportions with the addition of the OLE registration database, Windows for Workgroups' PROTOCOL.INI, and a plethora of private .INI files. Windows 95 can read these configuration files for backward compatibility, but it supplants their myriad duties with a binary object called the Registry.

Although the Registry is still spread across multiple files, the Windows 95 Registry Editor displays it as a unified entity. Such singularity is a welcome change from the disjointed collection of ASCII files in Windows 3.x, but the Registry is much more complicated than its ASCII counterparts. Instead of storing setup information in a sequential list, Windows 95 uses a hierarchical tree structure that replaces simple .INI file entries with complicated monikers such as My Computer\HKEY_CLASSES_ROOT\CLSID\{20D04FE0-3AEA-1069-A2D8-08002B30309D}\DefaultIcon.

Microsoft's dearth of documentation makes things even more difficult. The Windows 3.1 Resource Kit included 70 pages devoted to .INI files. Although these pages contained a few errors (the kit documented Windows 3.0 restrictions that had been removed in Windows 3.1), they were invaluable to serious Windows users. In contrast, the Windows 95 Resource Kit documents the Registry with 25 smaller pages that are watered down with graphics and generalities. Microsoft has graduated from a mildly complicated, poorly documented system to a system that is overly complicated and virtually undocumented.

You can change many of the Registry settings via dialog boxes in the Windows Explorer, the Control Panel, or other shell applications, but you will often have to edit the

Registry directly. To ease the difficulty of such editing, this three-part column will shed some light on the Registry and the Registry Editor, then step through a few system customizations. In this issue, you will learn how to change the icons for My Computer and Network Neighborhood, among other things. In upcoming issues, we'll discuss CLSID keys (class IDs for OLE interfaces), saving the position of Desktop icons, and adding personal items to the New menu.

THE REGISTRY EDITOR

The Registry Editor is a dual-mode program that can run under Windows or from a real-mode DOS prompt. Windows 95 automatically installs the Registry Editor in your Windows folder, but does not insert a shortcut onto the Start Menu or the Desktop. For quick access to the editor, you must create your own shortcut, or merely type Regedit.exe into the Run dialog.

When you start the editor from Windows, it has a split-screen view that resembles the Explorer interface: a tree structure of Registry keys (the analog of file folders) is displayed on the left and the contents of individual keys are displayed on the right (see Figure 1). Each key contains various subkeys (the analog of subfolders) and value entries (the analog of files). A value entry has three parts: a name, a data type (dword, binary, or ASCII

MRUList, and several binary value entries (a, b, c, [, and so on). Because of the Registry's deep hierarchical structure, value entries are assigned pathnames of extreme length:

```
My Computer\HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Applets\Explorer\StreamMRU\{Default}
```

A status bar at the bottom of the Registry Editor window displays the full pathname of the currently highlighted key or value entry (see Figure 2).

Because the Registry Editor loads with only the root keys showing (see Figure 1), you must do a great deal of clicking and scrolling before reaching any significant value entries. You can use the Find dialog to move to a given key, but it is almost as slow as manually expanding the tree (Find is useful, however, when you are unsure about a key's location).

The Registry Editor does not have as many slick features as the Windows Explorer, but its editing tools are intuitive and useful. To change the names of keys or value entries, choose the Rename feature from either the Edit menu or the menu that results from right-clicking on a Registry item. These two menus also allow you to create new subkeys and value entries. To edit actual Registry data, simply double-click on a value entry's

name. This will bring up a dialog box that contains a hex view of the binary data stream and an ASCII view of embedded strings (see Figure 3). The data is live, and you can edit it directly.

USER.DAT AND SYSTEM.DAT

The Registry Editor presents the Registry as a unified database, but it is actually separated into two or more files. Ordinarily, the two files are

C:\Windows\User.dat, which stores user-specific files, and C:\Windows\System.dat, which stores PC-specific files.

This division allows networked users to log on to multiple machines. User X, for instance, ordinarily logs on to machine X with a given

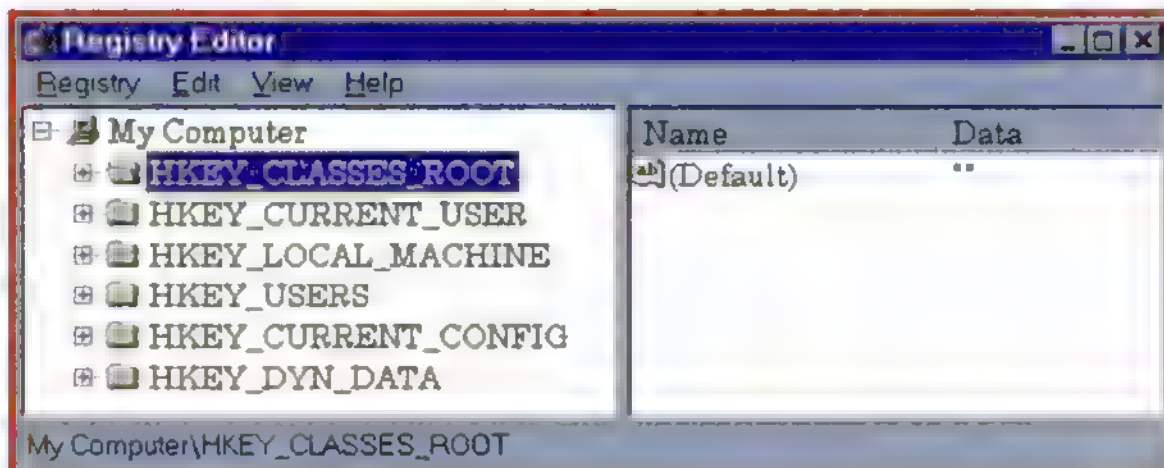


FIGURE 1: When the Registry Editor is first loaded, it displays the six root keys of the Registry tree.

string), and the data itself (up to 64K in size). Each key contains a string value entry called Default that usually (but not always) identifies the key's purpose.

In Figure 2, the right screen displays a Default value entry, a string value entry called

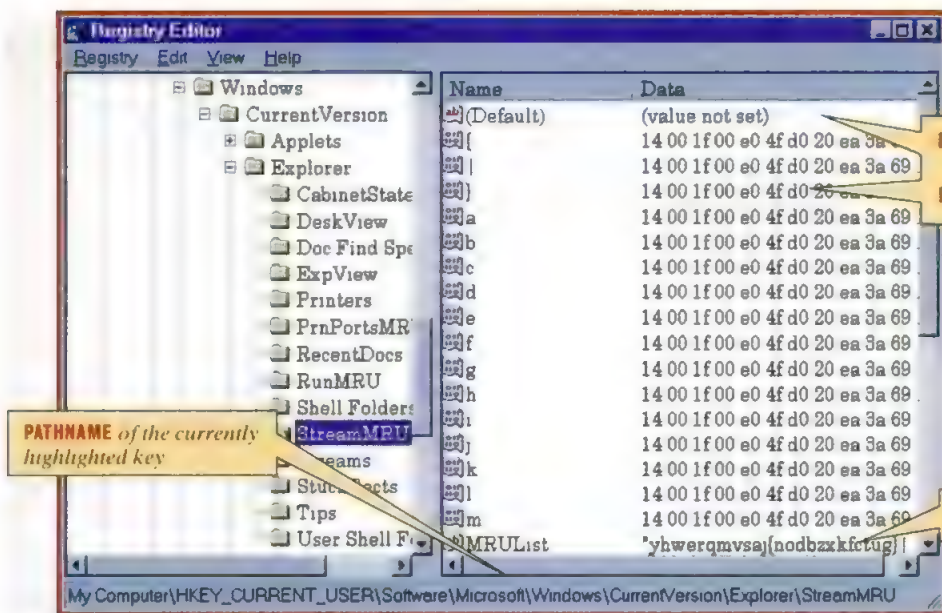


FIGURE 2: The Registry resembles the tree structure of Explorer. The hierarchy of keys is on the left, while value entries are on the right.

set of registry files. Because these files are mutually exclusive, user X can also log on to machine Y with his own User.dat and machine Y's System.dat. Thus, user X's profile will supply items such as the wallpaper bitmap, while machine Y's profile will provide the hard disk drivers and other PC-specific data.

The same paradigm allows you to configure a single machine for multiple users. To set up a home PC for several different family members, for instance, bring up Control Panel's Password applet, click on the User Profiles tab, and select the radio button that reads Users Can Customize Their Preferences and Desktop Settings (see Figure 4).

If a new user logs on and customizes the interface, Windows 95 creates a new folder within C:\Windows\Profiles that contains a copy of User.dat, the Start Menu folder, and the Desktop folder. The new User.dat contains entries that point to the new Start Menu and Desktop folders. The Registry for this new user is built from the new User.dat and System.dat.

THE ROOT KEYS

In some cases, two separate Registry keys will point to the same block of data. To observe this phenomenon, view the Default value entry in HKEY_CLASSES_ROOT*.386, then scroll to the Default value entry in HKEY_LOCAL_MACHINE\Software\Classes*.386. Each con-

tains a string that reads *vxdfile*. If you change this string in one key, you will concurrently change it in the other. A little more investigating reveals that both HKEY_CLASSES_ROOT and HKEY_LOCAL_MACHINE\Software\Classes contain not only identical data, but identical subkeys.

Once you are aware of such duplications, the Registry structure is much easier to grasp. It contains six root keys, which make up the first level of the tree. All other keys are subkeys of these six:

- HKEY_LOCAL_MACHINE contains all the data from System.dat, which covers drivers,

installed hardware, communication ports, software configuration, and other system-specific items.

- HKEY_USERS contains a subkey for the Default User.dat and a subkey for the current user's User.dat (if a PC is set up for only one user, it will contain only the Default subkey). The Windows Resource Kit claims that HKEY_USERS contains a subkey for all the User.dat files that reside on the system, but this is not the case.

- HKEY_CLASSES_ROOT, which is a duplicate of HKEY_LOCAL_MACHINE\Software\Classes, contains data on OLE, shortcuts, drag-and-drop, and other core interface features.

- HKEY_CURRENT_USER contains data from the current user's User.dat. Consequently, it is always a duplicate of a subkey in HKEY_USER.

- HKEY_CURRENT_CONFIG contains information on currently attached hardware. Since HKEY_LOCAL_MACHINE\CONFIG holds all of a system's possible hardware profiles, HKEY_CURRENT_CONFIG is always a duplicate of a subkey in HKEY_LOCAL_MACHINE\CONFIG.

- HKEY_DYN_DATA, which is stored in RAM for rapid access, contains information on devices that have been installed, loaded, or unsuccessfully loaded.

The Registry, therefore, has only three keys that are not duplicates: HKEY_DYN_DATA, HKEY_USER, and HKEY_LOCAL_MACHINE. Consequently, if you export the entire Registry, the resulting .REG file contains only two root keys: HKEY_USER and HKEY_LOCAL-

MACHINE (HKEY_DYN_DATA resides in RAM).

The root key structure may seem redundant, but its duplications are fairly helpful. HKEY_CURRENT_USER and HKEY_CURRENT_CONFIG allow you to isolate your machine's present setup from other profiles that may not be relevant. HKEY_CLASSES_ROOT is essentially a copy of the entire Registration database, which is the most important means of changing your setup (more on this in Part 2).

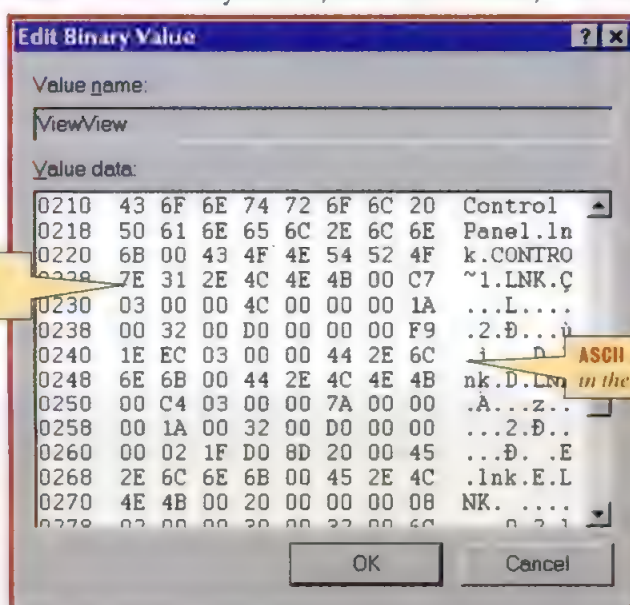


FIGURE 3: Double-clicking on a value entry brings up a dialog box that allows you to edit Registry data.

REGISTRY BACKUP AND .REG FILES

In case you make a change that prevents Windows 95 from rebooting, you should take a few minor precautions before editing the Registry. First, create a startup disk by bringing up the Add/Remove Programs applet from the Control Panel and clicking on the Startup Disk tab;

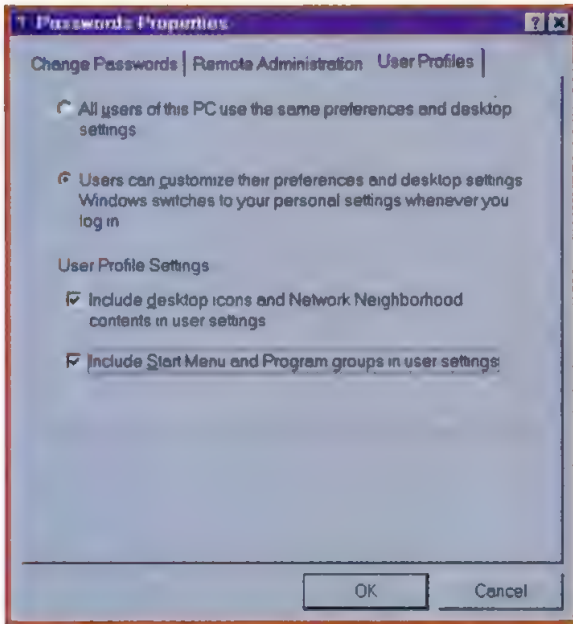


FIGURE 4: The Passwords applet that resides in the Control Panel lets you set up multiple users on one machine.

such a disk will let you start Windows 95 from a floppy disk drive if you cannot do so from your hard disk. Secondly, make both binary and text backups of the Registry itself. You can make a binary backup by copying User.dat and System.dat from the Windows folder. For text backups, use the Registry Editor's Export feature.

The Editor's Export and Import features allow for easy transfer of Registry files, which are ASCII renditions of the Registry tree. A Registry file carries a .REG extension and sequentially lists text versions of value entries:

```
[HKEY_LOCAL_MACHINE\Software\Classes\
➔Faxcover.Document\DefaultIcon]
@ = "C:\Windows\Faxcover.exe,1"
```

This statement identifies a particular key (within brackets) and assigns a data string to its Default value entry (@ signifies Default). Faxcover.exe stores several icons that can be assigned to fax cover pages. The above data string tells the system to use the second icon in Faxcover.exe (.1 is used for the second icon, as we explain below).

To create a .REG file from a Registry branch, simply highlight the appropriate key and select Export Registry File from the Registry Editor menu. The Import Registry File command reverses this process; after you highlight a particular key, it will incorporate a .REG file into the branch of the Registry tree that you have selected. You can also import Registry information by simply double-clicking on a .REG file or by running the Reg-

istry Editor from a DOS prompt. To import a Registry file from a DOS command line, type the name of the editor's executable followed by the name of the file: *Regedit File-name.reg*. Running the editor from DOS can help you recover from a Registry error that has disabled Windows or restore the positions of Desktop icons (to be explained in Part 2).

If you are going to experiment with a branch of the Registry, export that branch before making any changes. In the event of a fatal error, you can import the original settings and restore the configuration to normal. In case you forget to make backups, Windows 95 automatically copies the Registry to a pair of backup files (User.da0 and System.da0) after a successful boot. In addition, the Windows 95 CD includes a program called Cfgback.exe that will save up to nine extra copies of the Registry.

CHANGING DESKTOP ICONS

The Windows 95 Plus! pack allows you to change the icons for My Computer and Network Neighborhood, but making such changes via the Registry Editor will help you understand the role of the Registry itself.

Icons are always identified in Default value entries that reside in Default Icon keys. The actual value will always have the same form:

Filename, N

where *Filename* is the name of the icon file (typically an .EXE, .ICO, or .DLL file) and *N* (an integer greater than or equal to 0) specifies a particular icon within that file.

To view the icons in a given file, open any shortcut's property sheet, go to the Shortcut

tab, and select Change Icon. After you click on Browse and find the file you wish to view, the dialog will display all the icons stored in that file. Figure 5 displays the icons in C:\Windows\System\Shell32.dll. The first icon from the left is icon 0, the second icon from the left is icon 1, and so on. Thus, a value entry that identifies the sixth icon from the left would read:

C:\Windows\System\Shell32.dll,5

If a file contains only one icon, then no integer value is required.

To change the icon that represents My Computer, open the Registry Editor and scroll to HKEY_CLASSES_ROOT\CLSID\{20D04FE0-3AEA-1069-A2D8-08002-B30309D}\DefaultIcon. After double-clicking on the Default value entry, type in a new data string that points to the icon file and icon you

If you are going to experiment with a branch of the Registry, export that branch before making any changes.

wish to use. To change the Network Neighborhood icon, access the {208D2C60-3AEA-1069-A2D7-08002B30309D} key instead. These keys should contain the names My Computer and Network Neighborhood, but their Default value entries are initially empty (Value Not Set). If you rename My Computer or Network Neighborhood on your desktop, however, Windows 95 will put the new names into these Default value entries, even if the new names are still My Computer or Network Neighborhood. Renaming the icons will make it easier to locate these keys in the future.

The arcane names of these two keys may seem absurd, but Part 2's discussion of CLSID keys will explain them. Although such arcane names are prevalent and the tree structure is complicated, the Registry is a welcome improvement over the .INI files of Windows 3.x. Once you become familiar with its design, you will never want to return to AUTOEXEC.BAT, CONFIG.SYS, and .INI files; with Windows 95 you won't have to. □

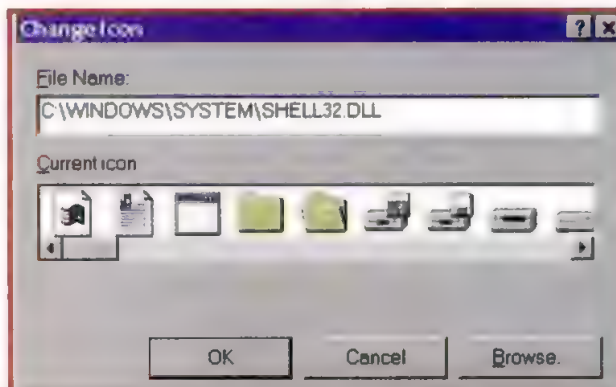
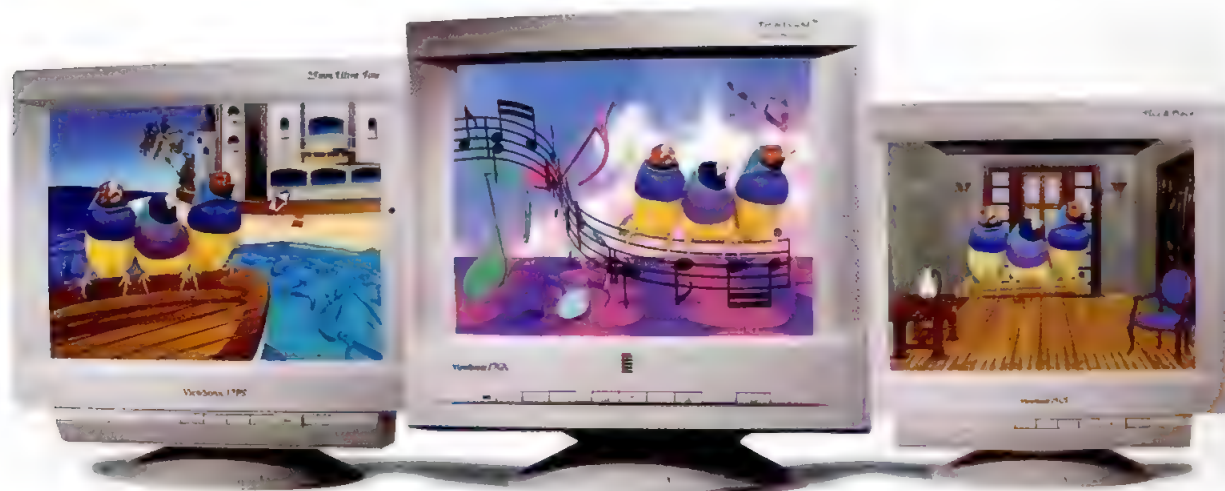


FIGURE 5: The Change Icon dialog displays all the icons that are contained in a particular file.

Barry Simon is a contributing editor of PC Magazine.



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CIRCLE 118 ON READER SERVICE CARD



PC Tech/Power Programming

By Ray Duncan

Tables for Your Home Page

HTML 3.0 and Netscape now let you present information in tables.

Just as the World-Wide Web has been blossoming, Hypertext Markup Language (HTML) has been evolving at a breakneck pace. HTML is the text-based language used to encode pages for publication on the Web (for an introduction to HTML, see the Power Programming column of June 13, 1995). The first HTML specification, usually referred to as Version 0.9 or Version 1.0, was designed for publishing scientific papers on the Web—it provided such features as six levels of headings, simple character attributes, quotations, source code listings, several types of lists, in-line graphics, and hyperlinks to other documents and images. The first graphical Web browser in widespread use, NCSA Mosaic Version 1.0.3, implemented this initial version of HTML.

The next generation of HTML, Version 2.0, was designed to provide better support for interactive Web applications. It offered a variety of simple controls, such as pop-up or drop-down menus or “pick lists,” check boxes, buttons, and text-entry boxes that could be used for building up forms to collect information from a user. People quickly adopted these features and used them to construct general-purpose feedback forms, Web-based order-entry applications, and platform-independent front-ends for database publishing via the Web. Netscape Navigator, Version 1.0, was the first browser in widespread use to offer forms support.

The latest version of HTML, formerly referred to as “HTML-Plus” but now generally known as HTML Version 3.0, defines a number of new capabilities, the most important of which is a simple but powerful encoding scheme for tables. Because of their elegance, flexibility, and visual appeal, tables are rapidly superseding image maps and the several types of HTML lists for the structured presentation of menus and data. At the time this column is being written, Netscape Version 1.1 is the only browser in production that fully supports tables.

In the simplest sense, HTML tables are comparable to the tables in Microsoft Word—you can designate a portion of the document to be a grid of cells with an arbitrary number

of columns and rows, and the contents of each cell can be any combination of text and graphic elements. You can format the text within each cell in many different ways, independent of other cells in the same table, almost as if each cell were a little word processing document in its own right. But HTML tables have some interesting features not typically found in word processors, such as machine independence, dynamic sizing, and the ability to nest one table inside another.

HTML Version 3.0 is not yet finalized, so parts of this column could be obsolete by the time it appears in print. Additionally, Netscape Version 1.1 recognizes some table commands that are not yet part of the HTML Version 3.0 specification and may or may not work with other table-enabled browsers as they appear. By virtue of its domination of the market, though, Netscape has become a de facto standard and is the target browser for most Web information publishers. So we can

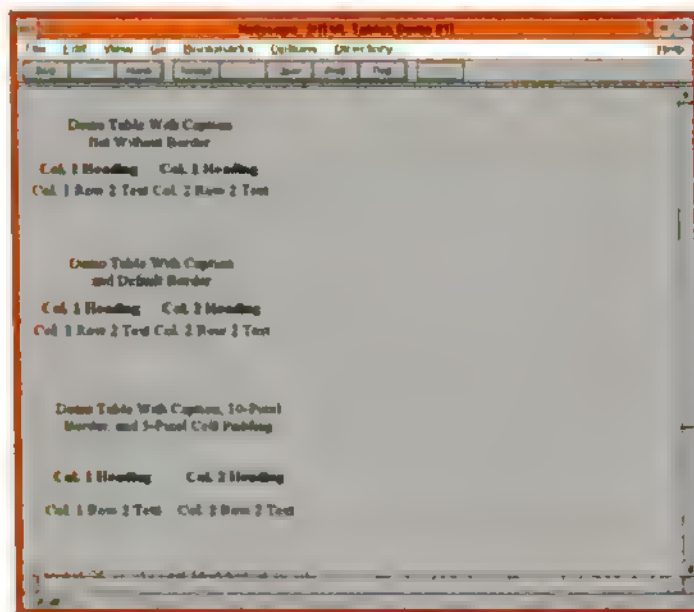


FIGURE 1: The HTML document from Figure 2, as it appears in the Netscape Navigator Version 1.1 Web browser, demonstrates some simple tables with and without borders and gridlines.

hope that HTML 3.0 and Netscape table support will converge to a single specification in the near future.

You can refer to the Web itself for the latest iteration of the HTML 3.0 document-type definition and further information on HTML table tags, starting with World-Wide Web Consortium's home page at <http://www.w3.org>.

HTML TABLE BASICS

An HTML table is delimited by the `<TABLE>` and `</TABLE>` tags. These tags should occur only within the `<BODY>` section of a document. A document can contain any number of tables, and tables can be embedded (with caution) inside other tables.

Within a `<TABLE>` tag pair, each row of the table is delimited by paired `<TR>` and `</TR>` tags, and each cell within a row is delimited by paired `<TD>` and `</TD>` tags. A tag pair for table headings, `<TH>` and `</TH>`, is essentially the same as the `<TD>` and `</TD>` tags, except that it formats text with the emphasized and centered attributes. So the skeleton of a document containing a heading and a single 2-by-2 table would look something like this:

```
<HTML>
<HEAD>
<TITLE>Title Text</TITLE>
</HEAD>
<BODY>
<H1>Heading Text</H1>
<TABLE>
<TR>
<TH>Column heading 1</TH>
<TH>Column heading 2</TH>
</TR>
<TR>
<TD>Cell Text</TD>
<TD>Cell Text</TD>
</TR>
</TABLE>
</BODY>
</HTML>
```

Normally, the Netscape browser immediately displays text it receives from the server, modifying the scroll bar to make additional text available as it arrives until the whole document has been transferred. As you have probably noticed, however, in-line graphic images can cause Netscape to delay displaying text until a graphic's size is known. Similarly, when the browser encounters a `<TABLE>` tag, it will not display any part of the table until it receives the entire table from the server and can determine a best-fit layout for column and cell sizes.

TABLE BORDERS AND CAPTIONS

By default, tables do not have any borders or gridlines. In the absence of such markings, the user will see an orderly arrangement of text, but may not have a clear idea where the


```

<HTML>
<HEAD>
<TITLE>
HTML Tables Demo #1
</TITLE>
<BODY>
<H1>Table Borders and Captions</H1>
<HR><P>

<TABLE>
<CAPTION>Demo Table With Caption<BR>But Without Border
</CAPTION>
<TR><TH>Col. 1 Heading</TH><TH>Col. 2 Heading</TH></TR>
<TR><TD>Col. 1 Row 2 Text</TD><TD>Col. 2 Row 2 Text
</TD></TR>
</TABLE>

<P><HR><P>

<TABLE BORDER>
<CAPTION>Demo Table With Caption<BR>and Default Border
</CAPTION>
<TR><TH>Col. 1 Heading</TH><TH>Col. 2 Heading</TH></TR>

```

```

<TR><TD>Col. 1 Row 2 Text</TD><TD>Col. 2 Row 2 Text
</TD></TR>
</TABLE>

<P><HR><P>

<TABLE CELLSPACING=10 CELLPADDING=5 BORDER>
<CAPTION>Demo Table With Caption, 10-Pixel Border,
and 5-Pixel Cell Padding</CAPTION>
<TR><TH>Col. 1 Heading</TH><TH>Col. 2 Heading</TH></TR>
<TR><TD>Col. 1 Row 2 Text</TD><TD>Col. 2 Row 2
Text</TD></TR>
</TABLE>

<P><HR>
<ADDRESS>
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</BODY>
</HTML>

```



FIGURE 2: The HTML code for a document demonstrating simple tables with and without borders and gridlines. Note that the **CELLSPACING** and **CELLPADDING** modifiers for the **<TABLE>** tag are Netscape extensions and are currently not part of the HTML 3.0 draft standard. To see how this document looks in the Netscape browser, refer to Figure 1.

```

<HTML>
<HEAD>
<TITLE>
HTML Tables Demo #2
</TITLE>
<BODY>
<H1>Table Text Flow and Character Attributes</H1>
<HR><P>

<TABLE BORDER>
<CAPTION>Table Demonstrating Text Flow
and Character Formatting Tags</CAPTION>
<TR><TH>Col. 1 Heading</TH><TH>Col. 2 Heading</TH></TR>
<TR><TD><H1>A Level 1 Heading</H1></TD>
<TD>Here are 2 lines of text in a cell<HR>
separated by a Horizontal Rule tag.</TD></TR>
<TR><TD>Here are two paragraphs in a single cell.
<P>This is the 2nd paragraph.</TD>
<TD>Here are 2 lines of text in a cell,<BR>
separated by a Line-Break tag.</TD></TR>
<TR><TD><B>Here is some text with the Bold tag.</B></TD>
<TD><I>Here is some text with the Italic tag.
</I></TD></TR>
<TR><TD><TT>Here is some text with the TTY tag.</TT></TD>
<TD><CODE>Here is some text with the Code tag.
</CODE></TD></TR>
</TABLE>

<P><HR><P>

<TABLE BORDER>

```

```

<CAPTION>Table Demonstrating Alignment Tags</CAPTION>
<TR><TH>Col. 1 Heading</TH><TH>Col. 2 Heading</TH></TR>
<TR><TD ALIGN="center" VALIGN="middle">Centered middle-
aligned text.</TD>
<TD>Here is a bunch of text in a cell with default
alignment.
Here is a bunch of text in a cell.</TD></TR>
<TR><TD ALIGN="left">Left-aligned text.</TD>
<TD ALIGN="right">Right-aligned text.</TD></TR>
<TR><TD>Here is a bunch of text in a cell with default
alignment.
Here is a bunch of text in a cell.</TD>
<TD ALIGN="center" VALIGN="top">Centered top-aligned
text.</TD></TR>
<TR><TD>Here is a bunch of text in a cell with default
alignment.
Here is a bunch of text in a cell.</TD>
<TD ALIGN="center" VALIGN="bottom">Centered bottom-
aligned text.</TD></TR>
</TABLE>

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```



FIGURE 3: The HTML code for a document demonstrating simple text formatting and text alignment within cells. To see how this looks in the Netscape browser, refer to Figure 4.

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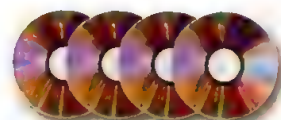


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table starts and ends and the text in the body of the document continues. There are numerous situations where borderless tables are entirely appropriate, such as the presentation of a compact list of hyperlinks or of a traditionally multicolumn document (such as a newsletter or brochure). However, in most cases where you would use a table, it is helpful to mark off the cell divisions with borders and gridlines to help the user understand the data.

To add a default border and gridlines to a table, you include the BORDER modifier in the <TABLE> tag that initiates the table. For example:

```
<TABLE BORDER>
.
.
.
</TABLE>
```

You cannot independently control the table's border and gridlines. Their width and appearance can be expected to vary from one browser to another, much as the rendition of the <HR> horizontal rule tag varies among browsers. Netscape's default borders and gridlines have an attractive shaded, three-dimensional appearance.

You can place a caption on a table with the tag pair <CAPTION> and </CAPTION>. These tags should appear inside the <TABLE> and </TABLE> tag pair but outside any <TH>, <TD>, or <TR> tag pairs.

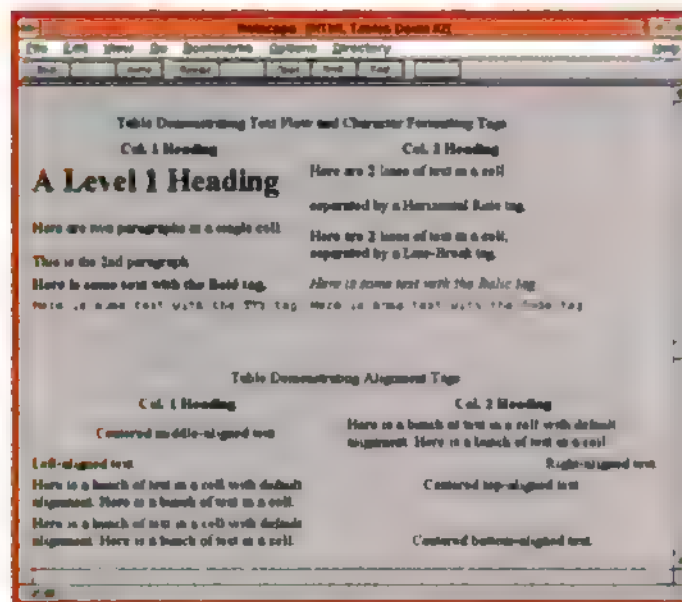


FIGURE 4: The HTML document from Figure 3, as it appears in the Netscape Navigator Version 1.1 Web browser.

<TR>, or <TD> tag pairs. The caption text is centered on the entire table and reflowed as necessary. The <CAPTION> tag can include an optional ALIGN modifier, which can take on the values "top" or "bottom" to place the caption above or below the table; if ALIGN is not used, the caption will be placed above the table.

For greater control over table borders and gridlines, Netscape has extended the HTML 3.0 specification of <TABLE> tags with the CELSPACING and CELLPADDING modifiers. For example, to create a table with 10-pixel-wide borders and gridlines, you would use the following CELSPACING modifier in the <TABLE> tag:

```
<TABLE BORDER CELSPACING="10">
.
.
.
</TABLE>
```

The CELLPADDING modifier is comparable to CELSPACING and has the same syntax, but it controls the amount of blank space between a table border or gridline and the text or graphic objects within a cell.

Figure 1 shows some example tables as they appear in the Netscape browser and Figure 2 contains the HTML source code for these simple tables.

FORMATTING TEXT WITHIN A CELL

Each cell within a table can be regarded as an independent little formatting domain of its own. Everything you already know about HTML tags that control the appearance of text in the Web browser continues to be valid. You can use the <P>,
, and <HR> tags to control text flow within a cell just as you would elsewhere in an HTML document. You can employ the heading tags <H1> through <H6> in cells as well, and they will exhibit their usual behaviors including forced interruptions in text flow and the provision of extra white space above and below the heading. Character-formatting with the , <I>, <TT>, , , and similar tags works as expected. Finally, you can use image and anchor <A> tags

```
<HTML>
<HEAD>
<TITLE>
HTML Tables Demo #3
</TITLE>
<BODY>
<H1>Table Row/Column Spanning and Width Control</H1>
<HR><P>

<TABLE BORDER>
<CAPTION>Demo Table With Row and Column Spanning
</CAPTION>
<TR><TH>Col. 1 Heading</TH><TH>Col. 2
Heading</TH><TH>Col. 3 Heading</TH></TR>
<TR><TD COLSPAN="2">Col. 1 Row 2, spanning 2
columns.</TD>
<TD>Col. 3 Row 2</TD></TR>
<TR><TD>Col. 1 Row 3</TD>
<TD>Col. 2 Row 3</TD>
<TD ROWSPAN="2">Col. 3 Row 3, spanning 2 rows.
</TD></TR>
<TR><TD>Col. 1 Row 4</TD>
<TD>Col. 2 Row 4</TD></TR>
</TABLE>

<P><HR><P>
```

```
<TABLE BORDER WIDTH="100">
<CAPTION>Demo Table With Width = 100 Pixels</CAPTION>
<TR><TH>Col. 1 Heading</TH><TH>Col. 2 Heading</TH></TR>
<TR><TD>Col. 1 Row 2 Text</TD><TD>Col. 2 Row 2 Text
</TD></TR>
</TABLE>

<P><HR><P>

<TABLE BORDER WIDTH="100%">
<CAPTION>Demo Table With Width = 100%</CAPTION>
<TR><TH>Col. 1 Heading</TH><TH>Col. 2 Heading</TH></TR>
<TR><TD>Col. 1 Row 2 Text</TD><TD>Col. 2 Row 2 Text
</TD></TR>
</TABLE>

<P><HR>
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duncan@csmc.edu">duncan@csmc.edu</A>
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</HTML>
```

FIGURE 5: The HTML code for a document demonstrating column and row spanning and use of the width modifier. To see how this looks in the Netscape browser, refer to Figure 6.



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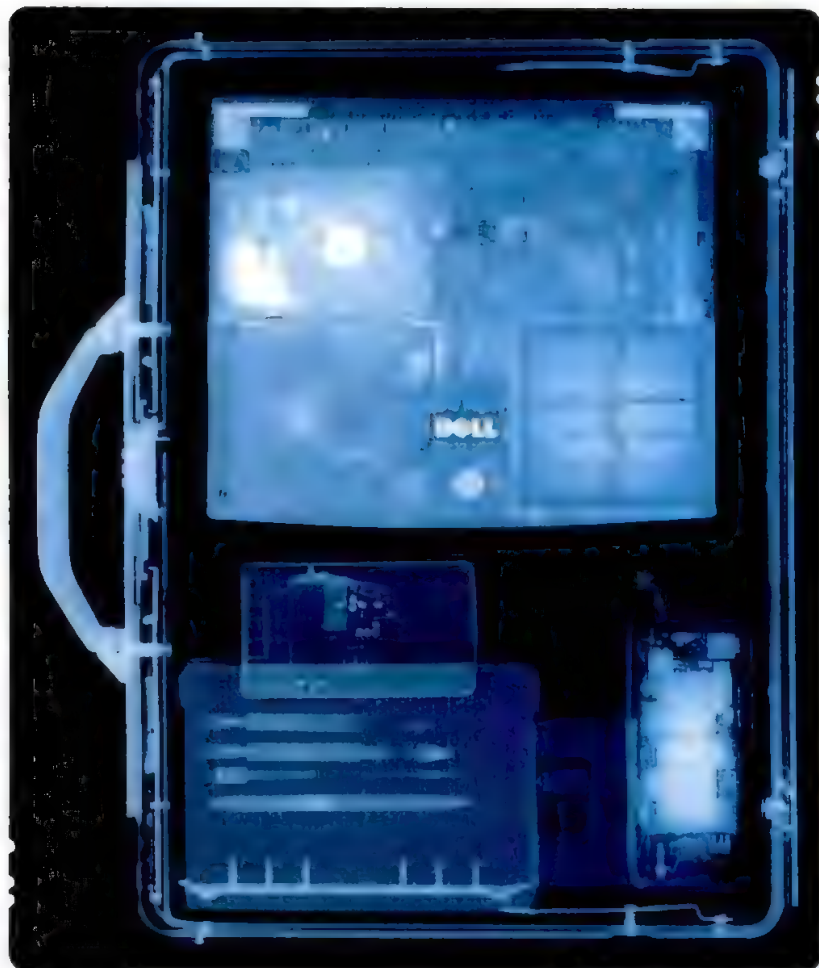
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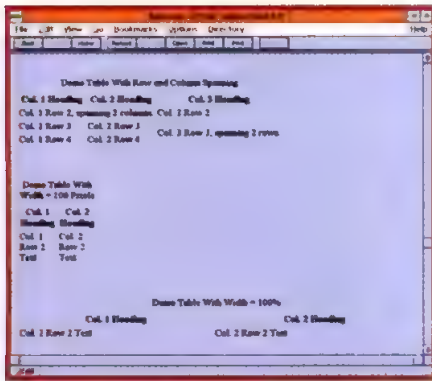


FIGURE 6: The HTML document from Figure 5, as it appears in the Netscape Navigator Version 1.1 Web browser.

spreadsheet user. The HTML 3.0 specification addresses these with the NOWRAP, ALIGN, and VALIGN modifiers for the <TH>, <TR>, and <TD> tags. The NOWRAP attribute turns off automatic text reflow within a cell, but it's generally a good idea to avoid using it, because it severely impairs the browser's ability to display the complete table attractively within the window limits. The ALIGN modifier controls the horizontal positioning of text within a cell and can accept the values "left", "center", or "right" to justify text. VALIGN controls the vertical alignment of text within a cell and can accept the values "top", "middle", "bottom", or "baseline".

within a table cell just as you would use them elsewhere.

The dynamic sizing of rows and columns by the browser does raise some text-positioning issues that would be familiar to any

If the NOWRAP, ALIGN, or VALIGN modifiers are included in a <TR> tag, they will affect all the cells in that row. A NOWRAP, ALIGN, or VALIGN modifier in a <TD> tag will apply to that cell only, and the latter two in a <TD> tag will override any ALIGN or VALIGN modifier in the enclosing <TR> tags. Note that the VALIGN="baseline" modifier makes sense only in a <TR> tag, because it causes the text in all the row's cells to be oriented to a single baseline (the usefulness of this particular feature isn't obvious until you get into some fairly complex tables).

Figure 3 contains the HTML source for some simple example tables demonstrating the use of headings, text-flow tags, character-formatting, and text alignment; Figure 4 shows the same tables as they appear in the Netscape browser.

```
Sub EmitHTMLTableHeader (FileNum As Integer,
    BorderWidth As Integer, CellPadding As Integer)
```

```
' Generate HTML table opening tag,
' using passed file number. Call with
' BorderWidth = 0 for no border, -1
' for default border, or positive value
' for explicit border width.
' Cell padding can also be specified
' by caller as a zero value
' (for default padding) or positive
' value (for explicit padding width).
```

```
Dim S1 As String
```

```
' create the opening portion of the TABLE tag
S1 = "<TABLE "
```

```
' if any border was requested,
' include the border modifier
If BorderWidth <> 0 Then
    S1 = S1 & "BORDER "
```

```
' if non-default border was requested,
' include CELSPACING modifier
If BorderWidth > 0 Then
    S1 = S1 & "CELLSPACING=" & Chr$(34) & LTrim$(
        Str$(BorderWidth)) & Chr$(34)
End If
```

```
' if non-default padding was requested,
' include CELLPADDING modifier
If CellPadding > 0 Then
    S1 = S1 & "CELLPADDING=" & Chr$(34) & LTrim$(
        Str$(CellPadding)) & Chr$(34)
End If
```

```
' close out the TABLE tag and write it
' to the disk file
```

```
S1 = S1 & ">"
Print #FileNum, S1
```

```
End Sub
```

```
Sub EmitHTMLTableRow (FileNum As Integer,
    ColumnCount As Integer, ColumnData() As String)
```

```
' This routine is called with a file
' number, a string array, and a count
' of items to generate the HTML code
' for a single row of an HTML table.
```

```
Dim X As Integer
```

```
' Emit HTML tag to start the table row
Print #FileNum, "<TR> ";
```

```
' Emit HTML tags & string data
' for a single cell
For X = 1 To ColumnCount
    Print #FileNum, "<TD>";
    Print #FileNum, ColumnData(X);
    Print #FileNum, "</TD> ";
Next X
```

```
' Emit HTML tag to end the table row
Print #FileNum, "</TR>"
```

```
End Sub
```

```
Sub EmitHTMLTableTrailer (FileNum As Integer)
```

```
' write the closing table tag to the
' specified file number
Print #FileNum, "</TABLE>"
```

```
End Sub
```

FIGURE 7: You can use these general-purpose Access/Visual Basic routines to generate HTML table code.

MERGING CELLS AND CONTROLLING CELL SIZES

As soon as you start building home pages and menus with tables in lieu of the older list and image-map constructs, you will begin to wish you could merge adjacent cells either horizontally or vertically so that the amount of text in a single large cell will not dominate the appearance of the entire table. HTML 3.0 provides this capability in the form of COLSPAN and ROWSPAN modifiers to the <TD> tag. The COLSPAN attribute takes a single numeric parameter that specifies how many columns the cell will span horizontally, proceeding toward the right. The ROWSPAN attribute for a <TD> tag works in an equivalent fashion but specifies how many vertical rows the cell will span, proceeding downward.

Proper coding of the COLSPAN and ROWSPAN attributes is a bit tricky, especially in the absence of sophisticated HTML editors that could let you design and set up the table visually and then generate the appropriate HTML tags to match. If you inadvertently specify column-spanning and row-spanning cells that somehow overlap and conflict, you can get unpredictable results. More important, any additional cells in a row or column that include a cell with a COLSPAN or ROWSPAN attribute may get pushed off the edge and disrupt the structure of the table.

In most cases, the browser's analysis of

table contents and dynamic sizing of rows and columns will result in an aesthetically proportioned table and efficient use of the window real estate. There are a few occasions, however, where you may want to control the absolute or relative width of the table within the window or of columns within the table. Netscape supports this functionality with the WIDTH modifier, which you can apply to any of the <TABLE>, <TH>, or <TD> tags. The parameter for the WIDTH modifier is a single numeric value, which can be either an absolute number of pixels or a percentage of the total window or table width.

Figure 5 contains HTML source code for some example tables that use the COLSPAN, ROWSPAN, and WIDTH modifiers, and Figure 6 shows the same tables as they appear in the Netscape browser.

A PRACTICAL APPLICATION OF TABLES

In the August 1995 Power Programming column, I discussed several strategies for database publishing on the Web and included some example Microsoft Access/Visual Basic routines for the export and HTML markup of an employee name, location, and phone number database. When I wrote that column, the Netscape Version 1.1 browser was not yet released, so I could not use

HTML tables to display the employee records in nicely aligned vertical columns of data item names and values. Consequently, the Access/Visual Basic routines used spaces and <PRE> tags, which force the browser to use a nonproportional font, aligning text in columns instead.

Now that Netscape Version 1.1 is in general use, you can take advantage of HTML table tags to format data in columns much more simply, with the fringe benefit that the usual proportional font will be used for increased readability.

Figure 7 contains the source code for some general-purpose Access/Visual Basic routines for generating HTML tables.

You can download the Access database containing the HTML-generation source code and a few sample employee records for your own experimentation from PC MagNet in the file HTMTAB.ZIP. □

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PC Tech/Internet Working

By Sean González

Java & HotJava: Waking Up the Web

The end of browser add-ons and the beginning of Web interaction.

By 1996, Sun Microsystems' Java programming language will be the hottest way to use the World-Wide Web. Spawned from a Sun research project that focuses on software development in networking environments, Java is an object-oriented language that resolves several of the Web's programming and functionality problems. Although Java is based on C++ and will be familiar to most developers, it has forsaken pointers, implemented background garbage collection, and introduced 16-bit characters. Serious Web surfers, however, will flock to Java because it eliminates the need for Web browser add-ons. It allows you to open any type of file without outside assistance.

Java cannot be used on just any Web browser. The only browser that currently supports the Java language is Sun's own HotJava software, which is in the alpha stages of development. Sun's Web site (<http://java.sun.com>) offers a version for Solaris 2.3, 2.4, and 2.5 on SPARC-based systems and for Microsoft Windows NT (MacOS 7.5 and Windows 95 versions are planned). In May, however, Netscape Communications announced that it will also support Java in a future release of its Netscape Navigator product.

ACCESSING UNKNOWN FILE TYPES

How many times have you encountered an audio file or an MPEG file that your browser was unable to open without an add-on utility? More often than not, Web users simply bypass such files because they do not have the add-on or they have not taken the time to install it. Even if you have installed an adequate viewer or audio player, however, it probably runs in a separate window and does not seamlessly integrate with your browser.

Ironically, Java-enabled

browsers circumvent this problem by not recognizing any file types at all. They no longer have to. When a Java browser receives a file, it can also receive the means to view that file. Via a networked environment of clients and servers, such browsers are linked to a broad range of applets, small Java programs that are able to view particular data protocols. If you encounter an unknown file type while surfing the Web, you can concurrently access an applet that can open it. When new protocols emerge on the Internet, therefore, your browser will automatically learn how to use them.

Applets, however, are not restricted to viewers and players; anything that you can do with C++, you can do with Java. Just as today's browsers can display an image on a Web page, Java-enabled browsers can run any type of application alongside a Web page's static content.

Because Java is multithreaded, you can even use multiple applets simultaneously. Sun's Web site demonstrates this functionality with three different sorting applets. As they run in different threads, you can start or stop

each of the three algorithms by clicking on the output graph that each one generates.

Today's browsers are movie screens that display a world of pretty pictures, sound, and inert text. Thanks to Java, however, tomorrow's browsers will let you truly interact with that world.

JAVA INTERNALS

If you are a C or C++ programmer, you will find Java programming extremely similar. It does, however, contain several differences that attempt to solve common C and C++ coding problems.

Under C and C++, pointers can easily cause data corruption; because of incorrect integer-to-pointer type casting, applications often attempt to read from bogus memory locations. But Java does away with pointers. Since it represents structures as classes and subclasses within its object-oriented framework, there is no need for pointers. As a result, many typical programming bugs are avoided.

Garbage-collection routines, which search memory for inactive segments, are an effective

way to clean up code, but they are not used as often as they should be. Some programmers forget to do garbage collection and end up with memory leaks that can sap their valuable development time. Java, however, performs automatic garbage collection, a process that is often criticized because it enervates processor time. Java deflects this problem by doing constant garbage collection in a low-priority thread that minimizes interruptions to the running application.

Sun has also made a small change to Java's primitive data types. Java still includes many of the same C

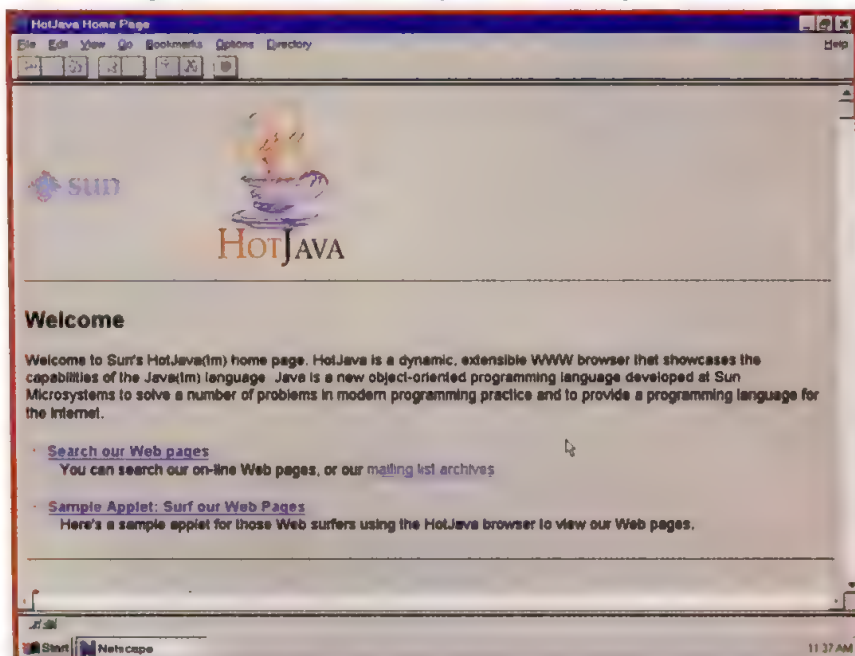


FIGURE 1: The HotJava home page (<http://java.sun.com>) will tell you everything you need to know about the Java language and allow you to download the HotJava alpha releases.

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and C++ types: unsigned byte (8-bit), short (16-bit), int (32-bit), long (64-bit), float (32-bit), double (64-bit), and Boolean. But the character data type uses the 16-bit unsigned Unicode character standard instead of the 8-bit standard used in C.

Because Java is an interpreted language, it reduces development time and eschews version mismatches by avoiding the code-compile-link-run cycle. Once an applet has been coded, you can compile it into a machine-independent form, which can then be transmitted to any Java-enabled browser. Because the applet is machine- and architecture-independent, the same copy can be used on any computer. This alone is a major savings for any software developer.

Java and its compiler aim to reduce the frequency of buggy code. Even buggy code, however, can be safely run on a Java browser

Incompatibilities with other vendors' software can be resolved by the common browser environment in which Java applets run.

because it is always contained within that browser's memory region. This protects against viruses that may invade your system when you execute an applet. Furthermore, applet transmission uses public-key encryption for source authentication.

INDUSTRY REPERCUSSIONS

Java and HotJava could make distributed applications a reality. Software companies will no longer have to worry about mailing upgrades; clients can simply connect to a company's site with a Java-enabled browser and load the new or upgraded applets that are required. Incompatibilities with other vendors' software can be resolved by the common browser environment in which applets run. Vendors can even handle payment for software directly on the Web via the security mechanisms that Java provides.

The World-Wide Web is no longer just an advertising billboard or a distribution medium for static content. Java and Hot Java allow you to test a vendor's products on your system with the click of a button. The Web truly becomes an interactive environment where you can run applications, interact with other Web users, and even manipulate data in ways never before possible. □

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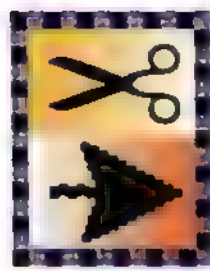


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PC Tech/Utilities

By Gregory A. Wolking

Edit Windows Recorder Macros

Change a macro's .REC file without having to rerecord.

Most word processor and spreadsheet users have at least a nodding acquaintance with the concept of macros—those miniprograms that let you record sequences of keystrokes, mouse movements, and commands so that you can replay them at will. Microsoft Windows' Recorder accessory is a generalized macro feature that works in most Windows applications.

The major weakness of the Windows Recorder is that you can't edit a macro once you've recorded it. If you make a mistake, there is no way to correct it; all you can do is record the macro again and hope you get it right. RecEdit, this issue's utility, eliminates this drawback and makes Recorder a more useful tool.

You can obtain RecEdit by downloading it from PC MagNet on CompuServe or from the Internet or by requesting it through the mail (see the sidebar "Guide to Our Utilities" for details). The Visual Basic source code is provided along with the executable for those interested in learning how RecEdit works.

USING RECEDIT

To install RecEdit, place the program files RECEDIT.EXE and RECEDIT.HLP in the directory of your choice and add an appropriate program item to Program Manager. Since RecEdit is a Visual Basic application, it requires the file VBRUN300.DLL. And it uses the Common Dialog control, so it also requires the file CMDIALOG.VBX. Both of these should be in your Windows SYSTEM directory. Note that RecEdit will not run under Windows 3.0, because it relies on features that were introduced with Windows 3.1.

When you start RecEdit, you will see an empty main window with a status bar at the top. To open a file for editing, you have the option of selecting Open from the File menu, pressing Ctrl-O, or double-clicking anywhere in the status bar. You may also have RecEdit open a file at startup by specifying its name on the command line.

Once you open a file, RecEdit will create and cascade its four child windows. If you prefer, you can tile the windows by selecting one of the Tile options from the Window menu (see Figure 1). The Macro List window will be on top, showing the macros contained in the

file. You use this window to view the names of the macros in the file, select a macro for editing, and delete macros from the file. You use the Properties window, which is similar to Recorder's Property window, to alter the global aspects of a macro, such as its shortcut key, name, description, and various playback options. You use the Event List window to make large-scale changes to the events a macro contains and the Event Editor window to change the parameters of individual events.

RecEdit provides full context-sensitive help. Pressing F1 at any time will open a help screen relevant to the active window, menu, or control; you can also click the right mouse

IN THIS ISSUE

RecEdit

RecEdit lets you edit macro files created by the Windows 3.1 Recorder accessory. It also lets you cut and paste events from one macro to another, combine .REC files, and even create your own .REC files from scratch.



button on any active child window or control. Space restrictions prevent a detailed explanation of all of RecEdit's features, but RecEdit's extensive on-line Help supplies full descriptions. If you are not familiar with Recorder, you should browse through the Help file before using RecEdit for the first time.

MACRO PROPERTIES

The basic unit in a Recorder file is a macro, which consists of two main parts: the properties and the event list. The properties determine how Recorder runs the macro, while the event list describes the individual actions Recorder will perform as the macro runs. RecEdit's Properties window (see Figure 2) is nearly identical to Recorder's, so I'll cover just the settings that are unique to RecEdit. If you are uncertain about how to use other settings, refer to RecEdit's on-line Help.

When the macro contains mouse events, Recorder saves the screen dimensions you are using. But Recorder does not use those values except to present a warning in its own Properties screen when the dimensions stored in the file don't match your current screen mode. It does not give you a way to change them; RecEdit does. This lets you edit mouse macros designed for a screen resolution other than what you're using while editing.

When you record a macro, Recorder automatically notes the state of Caps Lock, Num Lock, and Scroll Lock. When you run the macro, Recorder sets these toggles to the same states as when you recorded the macro and restores them to their original states when the macro ends. This is all done behind the scenes, and in fact lock states are not even mentioned within Recorder. RecEdit improves upon Recorder by letting you change the initial lock-state settings. Note, however, that this may have a radical effect on the macro's operation. A macro cannot force the state of these toggles once running; it can only change their state by generating the appropriate keystroke.

Recorder is capable of storing descriptions approaching 64K in size, but its edit window gets flaky if the text is too long. RecEdit limits descriptions to 1,024 characters to avoid this problem.

The final difference is that RecEdit provides an Undo button, which restores the macro's property settings to the same values as when you first activated the window. This function is available only while the Properties window is active. Once you switch to any other RecEdit window, you cannot undo your changes except by reloading the original file.

MACRO EVENTS

The real meat of a macro is its event list. This list tells Recorder what to do as the macro runs. There are two classes of events, keyboard and mouse, and there are several types of events within each class. For the keyboard event class, the event types are Key Down, Key Up, SysKey Down, and SysKey Up.

Key Down and Key Up mean, quite simply, that the specified key is either pressed or released. The SysKey events mean that the event applies to the target window's control

menu instead of its client area. A macro generates keystrokes using combinations of the above event types. For example, the "A" key-stroke requires two events:

Key Down, A
Key Up, A

As you might expect, the keyboard shifts (Shift, Ctrl, and Alt) are "sticky": Once pressed, they remain down until released. Thus, to send the series Ctrl-A, Ctrl-Alt-B to an application, you could use the following event sequence:

Key Down, Ctrl
Key Down, A
Key Up, A
Key Down, Alt
Key Down, B
Key Up, B
Key Up, Ctrl
Key Up, Alt

Most applications ignore Key Up events except for the Shift keys. So, you can have Recorder repeat a non-Shift key by sending a series of Key Down events and not worry about balancing them with Key Up events. In fact, this is how it appears to Recorder when you hold a key until it repeats: a series of Key Downs followed by a single Key Up. While a macro is running, your keyboard's "typematic" feature is disabled so that a change in your typematic settings (via Control Panel) will not affect the way the macro runs.

When you look at the event list for a macro that includes typing a string of text, the sequence of Key Down and Key Up events may appear to be hopelessly scrambled. This is because most touch-typists overlap their keystrokes, pressing one key before releasing another. If you like, you can use the Event List's swap feature to reorder the events into a neat logical sequence, but that's necessary only if you want to make the list easier to read.

For the mouse, the event types are Move, Left Down, Left Up, Right Down, and Right Up. The Move event means that the mouse pointer moves to the indicated coordinates, and the Left/Right Down/Up events mean that the corresponding buttons are pressed or released with the mouse pointer at the indicated coordinates. Recorder generates clicks, double clicks, and drags using combinations of the above.

The timing and coordinates of mouse events can be critical. Recorder records a double click as four events: Left Down, Left Up, Left Down, Left Up. Each event has coordinates associated with it, and the time between events is also recorded. This sequence will be recognized as a double click only if it takes place within the time specified in the DoubleClickSpeed key in the [Win-

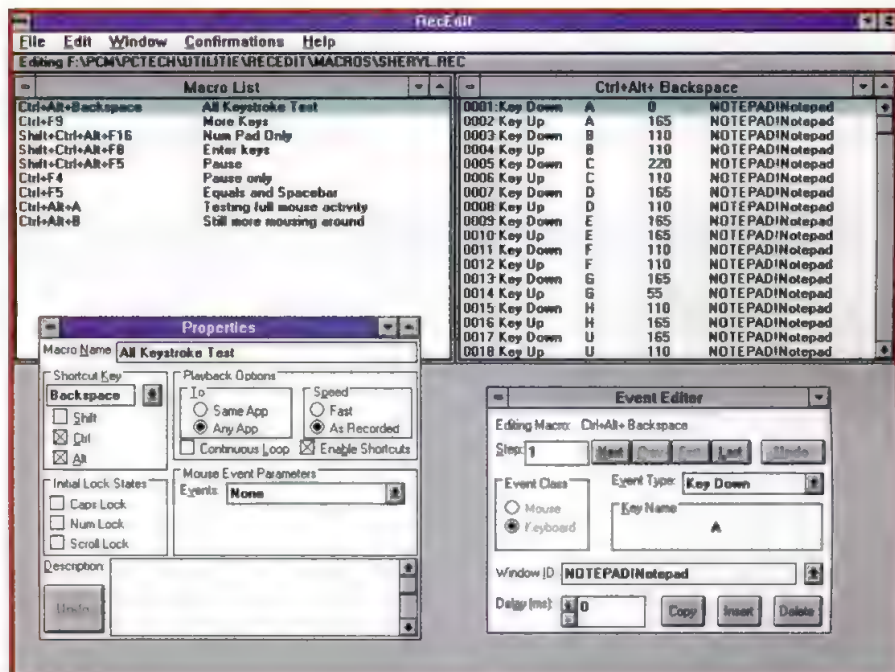


FIGURE 1: When you open a file, RecEdit creates four child windows: Macro List, Event List for the current macro, Event Editor, and Properties.

dows] section of WIN.INI. The coordinates of the two clicks must also be within the distance specified by DoubleClickHeight and DoubleClickWidth. (Note that these are usually absent from WIN.INI, in which case the default value of four pixels is used.)

A problem can arise if the values that define a double click change between the time you record a macro and the time you run it again. Thus it's worthwhile to use RecEdit to set the time interval to 0 and the coordinates to all the same values—so no matter how small DoubleClickWidth and DoubleClickHeight are, these events will still define a double click.

THE TOP 10 UTILITIES

- FDDLLS** Finds dead DLLs
- ICONJA** Icon manager
- STRING** Batch file enhancer
- 1MBF** Protects low memory
- FINDIR** IRQ line analysis
- FHUNT** Enhanced search tool
- COA** Changes program address
- SCHED** Runs programs automatically
- SPAD** Enhanced Windows notepad
- WTIME** Keeps PC clock accurate

Event List windows let you view a macro's events and make large-scale changes (see Figure 3). Each line in the list represents one event in the macro. The step numbers at the left side of the list are assigned arbitrarily; they serve only to help you keep your place as you edit. The format of each line depends on the class of the event. For keyboard events, the fields are Event Type, Key Name, Delay, and Window ID. (The Window ID, discussed below, ensures that the macro is played back in the correct window.) For mouse events, the fields are Event Type, X coordinate, Y coordinate, Delay, and Window ID. Mouse events will stand out from keyboard events, because the extra data field makes the line wider.

The last line in the list, shown as "9999: **** End ****", is merely a place holder. You cannot edit or delete this line. It serves only to give you an insertion point so that you can paste events onto the end of a macro. You can have an Event List window open for each macro in the file, making it easy to cut and paste events between macros. When you close an Event List window, RecEdit just hides that window and does not remove the data.

While an Event List is active, you may use the standard Windows methods to select multiple records, then either cut or copy them to RecEdit's clipboard (which is completely independent of the Windows clipboard) or change their Delay or Window ID settings. Once you cut or copy events to the clipboard, they remain there until you either cut or copy a new set of events or exit the program. Therefore, you may use the clipboard to copy events from one file to another.

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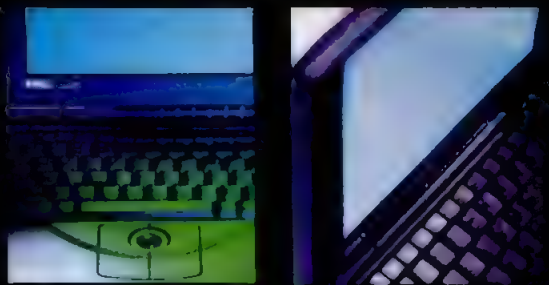
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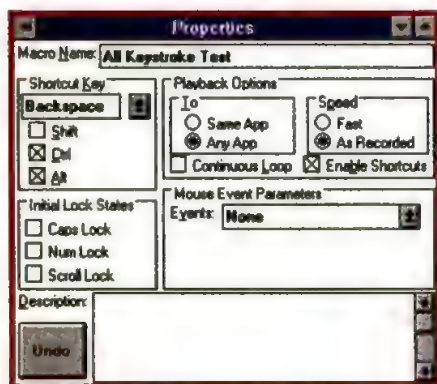


FIGURE 2: RecEdit's Properties window improves on Recorder's with an Undo button and the ability to change mouse-event settings and initial toggle states.

RecEdit's clipboard is intelligent. It won't let you paste mouse events into a macro that doesn't allow them, and it automatically checks the data size of the current macro to make sure that a paste operation won't exceed RecEdit's capacity. You may select noncontiguous events to cut or copy, but RecEdit cannot maintain the interval between them when pasting. The paste function always inserts the clipboard events in front of the current event as one contiguous block.

In addition to the clipboard functions, the Event list provides the following keyboard commands:

- Del: Deletes the selected events without affecting the clipboard.
- D: Activates multiple change mode for the Delay setting.
- W: Activates multiple change mode for Window ID setting.
- S: Swaps the current event with the one that follows.
- Enter: Opens the Event Editor window with the selected event loaded.

Note that the selection pointer stays with the original event, so that pressing S repeat-

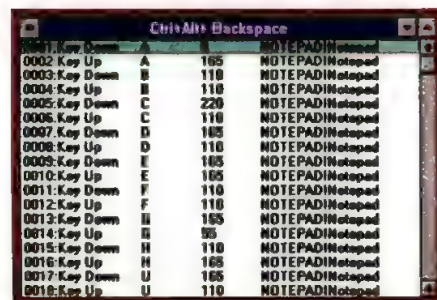


FIGURE 3: Event List windows let you view a macro's events and make large-scale changes. Double-clicking on a macro in the Macro List opens its Event List.

edly causes the event to migrate through the macro. For the D and W commands, RecEdit opens a small dialog box in the center of the window. Enter the new setting, then either

click the OK button to have RecEdit apply that setting to all selected events or click Cancel to return to the list without making any changes. When a multiple change command is pending, you cannot activate the Event Editor window.

EDITING INDIVIDUAL EVENTS

Double-clicking a line in an Event List activates the Event Editor window with that event loaded. This window lets you make changes to the parameters of individual events. Figure 4 shows how the Event Editor might appear after double-clicking line 11 of the Event List. If the macro is empty, all the controls in the Event Editor will be disabled except for the Insert button.

The Step text box shows you which step you are editing. Step numbers are assigned arbitrarily and serve only to help you keep your place as you edit; you cannot change them directly. You switch from one step to another by either typing a step number into the box or using the navigation buttons to the right of the box. RecEdit automatically synchronizes the corresponding Event List window as you make changes to the current event or move from one event to another. If you arrange the windows so that the Event Editor and its corresponding Event List are visible at the same time, it's easy to see the event you are editing in context.

The radio buttons in the Event Class box let you change keyboard events to mouse events and vice versa. If the macro's Mouse Info property is set to None, these buttons will be disabled. Recorder uses the fields of each event to record differently for each event class, so when you toggle an event from one class to another, fields may contain invalid information. Instead of forcing you to reenter the data, RecEdit supplies a default record that you may edit to suit your needs.

The Event Type list box lets you change the current event by selecting the desired type from the list. The contents of the box below the Event list depend on the event class. For mouse events, the box shows the coordinates where the mouse event occurs. Mouse coordinates are measured in pixels and must range between 0 and one less than the corresponding screen dimension. For keyboard events, the box shows the name of the key to be pressed (or released). To change the key assignment, either double-click anywhere in the Key Name box or press Alt-K to activate the Key Chart window (see Figure 5).

The Key Chart window displays a representation of a standard 102-key keyboard that includes all the keys the U.S. edition of Windows can recognize. To select a key, click the appropriate button. RecEdit tracks the state of the modifiers (Shift, Ctrl, and Alt) and toggles (Caps Lock, Num Lock, and Scroll Lock) as if the macro had been running up to the

point where the current event would be generated. If any of the modifiers are pressed or if any of the toggles are on, their keycap labels appear in boldface type.

The typewriter keycaps show the characters that would be generated in a text window based on the current Shift and toggle settings. There is not enough screen real estate to do the same for the numeric keypad, but the Key Name box shows you exactly which keystroke would be generated. Note that both RecEdit and Recorder recognize the difference between the digits on the numeric keypad and those on the typewriter section.

The Delay setting tells Recorder how long to wait, in milliseconds, before generating the current event. Recorder measures the delay

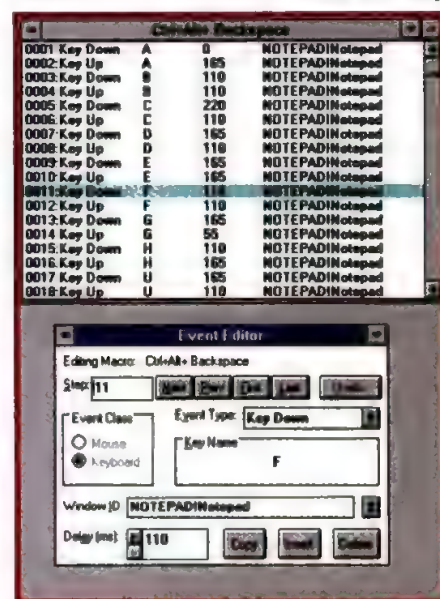


FIGURE 4: Double-clicking a line in an Event List activates the Event Editor for that event. The edited event is automatically highlighted in the list.

in intervals of 55 ms. You can change the delay setting incrementally using the Plus and Minus buttons beside the box, or you can enter a new value and RecEdit will round it down to the nearest multiple of 55 ms.

The Window ID setting comes into play when you set the Same App playback option. This text string tells Recorder which window should receive the event. Each macro has its own list of Window ID strings. These strings consist of two parts separated by an exclamation point: the name of the module that owns the window and the window's class name.

This method of identification is fairly reliable except for one drawback: Recorder cannot distinguish between multiple instances of an application and multiple instances of a given window class within an application. For example, if you launch three instances of Notepad and record a macro that types text into all three, that macro will not work properly be-

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Sam Whitmore (Moderator) is the editorial director of **PC Week**, the leading IS newsweekly, and an ardent follower of the impact of new technologies on corporate strategy and management methodology.

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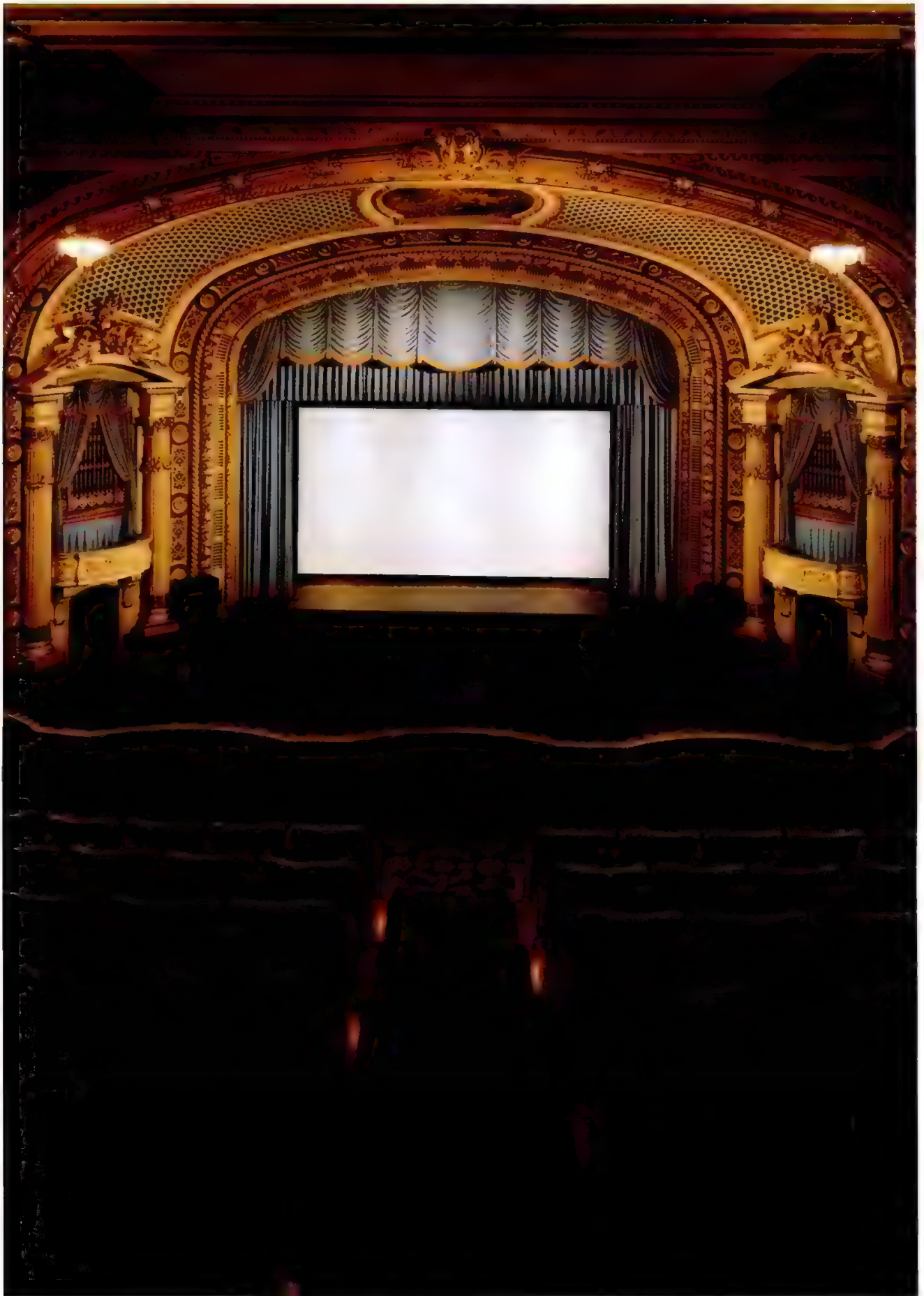


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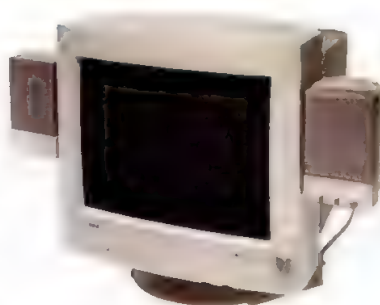




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cause Recorder will post all the keystrokes to the first instance of Notepad that it finds.

There are three ways to change the Window ID assignment: You can click the dropdown box and then select an ID from the list. You can type an ID string manually (the field is case-sensitive) and press Enter. Or you can click the dropdown box and then choose (Master List) which will always be the first item, to activate the Master List window. Of these three methods, the first is preferred, the second is risky at best, and the third is useful when you're creating your own macros from scratch. It tells RecEdit to query Windows and build a list of the ID strings of all the windows other than its own that it can find. The list can be quite long, but RecEdit sorts it alphabetically so that the strings will be grouped by their module names.

You can usually tell which strings belong to which apps by the module name at the beginning of the string. This is usually the base name of the application's .EXE file. The tricky part, though, is determining which class name to select. Unfortunately, there is little you can do other than pick a string and see if it works. Sometimes the class name will give you a clue as to the nature of the window. The class name of an application's main window is often similar to the name of the application itself—for example, the class name of Notepad's main window is Notepad, so the full ID string would be "NOTEPAD!Notepad".

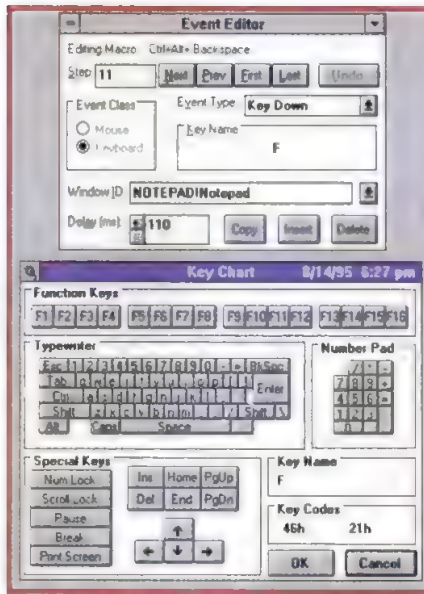


FIGURE 6: The Key Chart window, activated by double-clicking in the Key Name box of the Event Editor, lets you change key assignments.

As far as Windows is concerned, almost every object is a "window." Thus a given ID string may refer to a scroll bar, push button, text box, and so on. Some windows respond only to particular events, while others may not respond at all to keyboard or mouse input. RecEdit cannot determine which

events a given window will recognize.

The remaining controls in the Event Editor are straightforward. The Insert button inserts a default event at the current step in the macro, the Copy button inserts a copy of the displayed event at the current position, and the Delete button removes the current event from the macro. The Undo button restores the event's settings to their state when you first opened the window, but you can use it only while the Event Editor is active. As soon as you switch to any other RecEdit window, the changes become permanent. None of these buttons affect the contents of RecEdit's clipboard.

The Confirmations menu determines whether or not RecEdit will present a warning message before performing the actions listed. When an item is checked, RecEdit always warns you before performing that action and gives you a chance to cancel the operation. The Save Settings item writes the menu settings to RECEDIT.INI so that they become the defaults the next time you use RecEdit. (You can get further details on the contents of RECEDIT.INI from RecEdit's on-line help).

THE HAZARDS OF CHANGE

Many of the changes RecEdit allows have side effects, the most important of which is the handling of mouse events. When you change the screen dimensions in the Properties window, RecEdit will scan the current macro. If it finds

HEADER:

DWORD Signature (always 00061766h)
DWORD Offset of property data
WORD Number of macros in this file
(following are one or more macros)

MACRO:

WORD Signature (always 1789h)
(following are one or more events)

first event:

WORD: ??
WORD: Total number of events, including this one
WORD: ??
WORD: ??
WORD: ??

Keyboard event:

BYTE: Event type
0 Key Up
1 Key Down
3 SysKey Down
4 SysKey Up
BYTE: Event class (always 1)

BYTE: Scan code
BYTE: Virtual key code
WORD: Unused
WORD: Delay (times 55ms)
WORD: Offset of Window ID String

Mouse event

BYTE: Event type
0 Move
1 Left Down
2 Left Up
3 Right Down
4 Right Up
BYTE: Event class (always 2)
WORD: X coordinate
WORD: Y coordinate
WORD: Delay (times 55ms)
WORD: Offset of Window ID String

ASCII string(s): One or more Window ID strings
WORD: signature = \$1492, present if a description follows
ASCII: description

WORD: Signature = \$1969
.... followed by property information



FIGURE 6: The Recorder file format starts off with a header record followed by one or more event records and related information, followed by property information.

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any coordinates that are too large, RecEdit will ask whether you wish to adjust them, which means that it will set the coordinates to the maximum value for the current screen dimensions. Unless you plan to either rewrite or remove any adjusted mouse events, it's generally best to cancel the adjustment and restore the original screen dimension. If you decline the adjustment, RecEdit will leave the invalid coordinates in place. When you view an event in the Event Editor, RecEdit will display out-of-range coordinates in reverse video. You do not have to change such values, but if you do, the value you enter must fall within the current screen dimension setting.

Another side effect occurs when you save a .REC file. RecEdit maintains a list of the window ID strings used by each macro in the file. As you edit, RecEdit keeps all these strings in memory, so you can select them from the Event Editor's list box even if none of the events currently in the macro refers to that string. When you save the file, RecEdit must purge any strings not actually referenced by at least one event in a macro. Thus the unreferenced strings will be removed from the Event Editor's list box. When you save, RecEdit must also re-synchronize the Event Editor with the file's contents and disable the Undo button to prevent you from possibly undoing the event to a state that is no longer valid.

Although Recorder's file structure lets you store empty macros (those containing no events), Recorder may crash if you try to run them. To avoid this, RecEdit's save function deletes any empty macros before it writes the file. If all the macros in memory are empty, RecEdit will simply reset itself without altering the file on disk.

MERGING FILES

RecEdit's merge function is much more flexible than Recorder's. If there is a collision between the names or shortcut keys of any macros in the file you are merging, Recorder just presents an error message and skips that macro. Instead of rejecting such macros, RecEdit will assign a new shortcut key or name to the macro and present a message box telling you what changes it had to make.

When reassigning a shortcut key, RecEdit searches for an available combination that uses as many Shift modifiers as possible. As a safety feature, RecEdit will assign only shortcuts that include at least the Ctrl modifier. You can manually assign "dangerous" shortcut keys—those without the Ctrl modifier—but RecEdit will never do so automatically. If all the safe shortcut key combinations are in use,

Data Type	Meaning
-----	-----
BYTE	Virtual key code for macro's shortcut. 0 if none assigned.
BYTE	Bit fields as follows:
BIT	MEANING when set/reset.
---	-----
0	Shortcut does/does not include {Shift}
1	Shortcut does/does not include {Ctrl}
2	Shortcut does/does not include {Alt}
3	Mouse events relative to Screen/Window
4	Playback to Same App/Any App
5	Playback Fast/As Recorded
6	Shortcut keys enabled/disabled.
7	Continuous Loop enabled/disabled.
BYTE	Bit fields as follows:
BIT	MEANING when set/reset
---	-----
0	Caps Lock on/off at macro start.
1	Num Lock on/off at macro start.
2	Scroll Lock on/off at macro start.
3-7	Unused.
WORD	Size of event data block.
DWORD	Pointer to event data block.
WORD	Length of macro description *
DWORD	Pointer to description ID word *
WORD	Screen width in pixels.
WORD	Screen height in pixels.
STRING	Macro name as an ASCIIZ string. Field is 41 bytes long, but may contain garbage after the first NUL which marks the end of the name.

* If a macro's description is blank, Recorder does not store it, so these fields will both be NULL (0).

FIGURE 7: Macro Properties records are each 60 bytes long and consist of the data fields shown here.

RecEdit will merge the macro with no shortcut key assigned. The only time RecEdit will fail to merge a macro is when the macro would exceed RecEdit's capacity.

RecEdit's capacity is large, but it is smaller than Recorder's. This is because RecEdit must load the entire file into memory at once for editing, while Recorder loads a macro into memory only while it is being run or viewed. The upper limit for RecEdit is roughly 30,000 events (340K on disk)—plenty big for most users.

INSIDE RECEDIT

The hardest part of writing RecEdit was decoding the structure of Recorder's files. I'll spare you the gory details, but the basic process was to record a short macro, save it to a file, rerecord another macro with one or two small changes, and then compare the files. Once I got the file structure figured out, writing the rest of the program was fairly

easy. Figure 6 shows the structure of Recorder's files.

Recorder files are full of unexplained constants that I discovered by study and investigation. These constants appear to be "signatures" that identify different parts of the structure. Each .REC file begins with a 10-byte header that consists of three fields: a DWORD signature (always 00061766h), a DWORD holding the offset of the property data, and a WORD holding the number of macros in the file.

Immediately after the header are the data blocks for the events in each macro. Each data block begins with a WORD signature (always 1789h), followed by a series of 10-byte event records. The first record in each block contains the number of events in the block, including the header itself. Immediately after the event records come the macro's window ID strings in ASCIIZ format (ASCII text terminated by a 0 byte). Next comes a WORD value that contains the signature 1492h if the macro's Description field is not blank. The description text follows the signature, again in ASCIIZ format. The event data blocks are followed by another WORD signature (always 1969h), which in turn is followed by the properties records (see Figure 7), one for each macro in the file.

RecEdit uses two global arrays of user-defined types (declared in RECED-IT.BI) to store the macro property (M_list) and event (E_List) data. One string array (Window_ID\$) contains the window ID strings, while another array of user-defined types (wID_Ptr) maintains the relationship between the strings and the macros to which they belong. To conserve memory, RecEdit (like Recorder) does not store separate copies of the strings for each event. Instead, it maintains a list of unique strings for each macro. The event records simply contain offsets into this array. In a similar fashion, I used separate arrays to hold the events (E_Clip) and ID strings (Clip_wID\$) for the clipboard so that changes to the macros themselves do not affect the clipboard contents.

RecEdit uses the EL_Data() and EL_Form() arrays to keep track of the Event List windows. The EL_Form() array holds pointers to the forms themselves, while the EL_Data() tells which data each form contains. Specifically, it tells which macro the window contains, the offset into the E_List() array for the first event record belonging to that macro, and the current step being edited within the macro. Organizing the data this way makes it easy to determine whether an event list must be built or simply reactivated when the user double-clicks on an entry in the Macro List window. And it helps keep the

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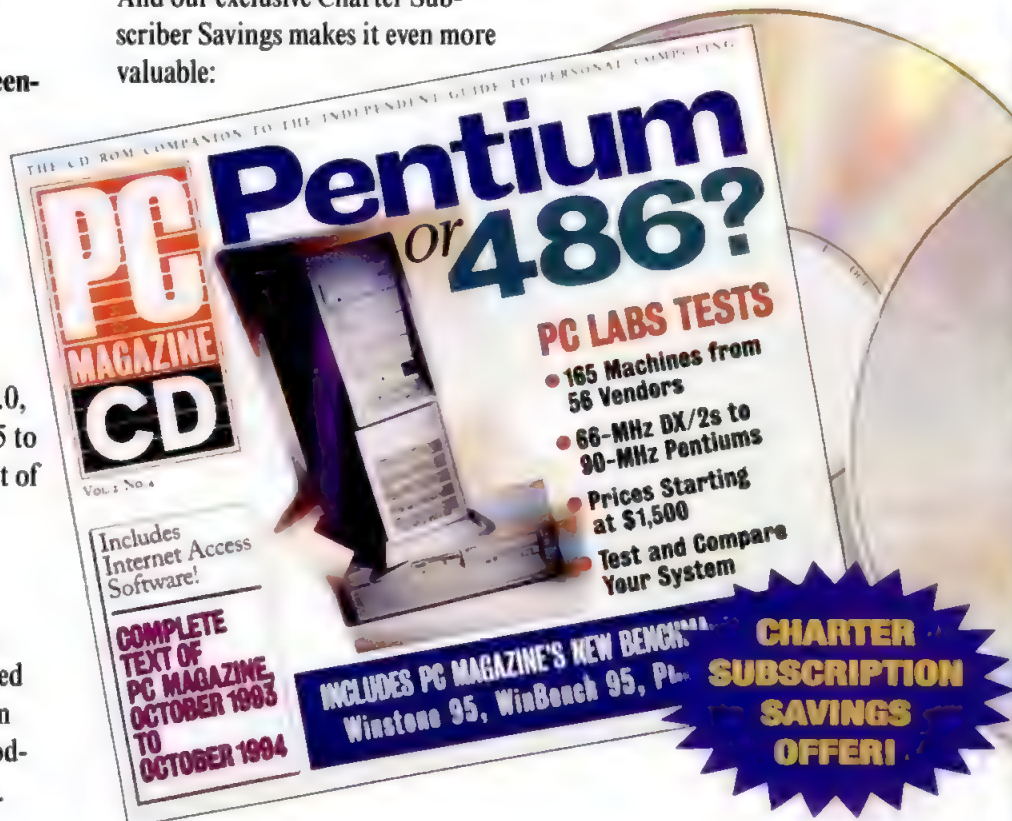
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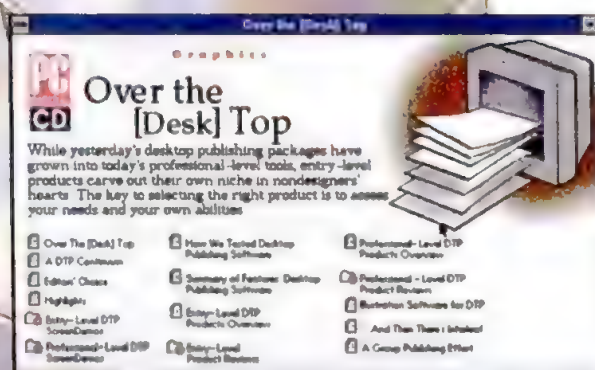
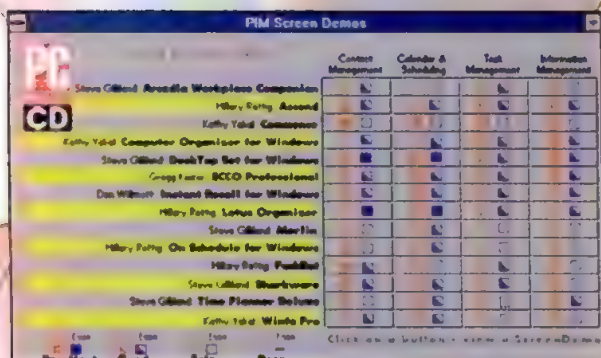
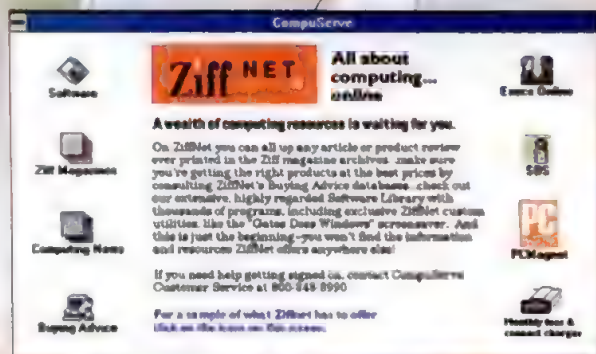


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various windows (such as the Event List and Event Editor) synchronized with each other as the user switches among them.

Another tricky part of the program is handling the validation of user entries. Many of the fields in RecEdit's windows are interrelated, so in some cases I use a common subroutine to handle validation for related controls. Another aspect of this interrelation is that changing the contents of one control (such as the Event Class option buttons in the Event Editor) may affect both the appearance and the contents of other controls in the same window. To prevent problems with cascades of click or change events, many of the event handlers begin with a check for a shared loading flag that prevents the event handler from executing when a routine elsewhere in the program changes a control's content or state.

I wrote RecEdit as an MDI (Multiple Document Interface) application. More astute readers may notice that RecEdit can edit only one "document" (.REC file) at a time. This is true.

The main reason I used MDI was to allow multiple event-list windows while maintaining a manageable user interface. I could have written RecEdit as a non-MDI app, but handling all the individual windows would have been both messy and unnecessarily complex. The MDI interface makes it very easy to keep all of an application's windows in one container.

One final note to other VB programmers: While writing RecEdit, I discovered an error in the Windows API help file provided with VB 3.0, Professional Edition. The declaration given for the WritePrivateProfileString() function is incorrect. The help file says:

```
Declare Function WritePrivate
  ProfileString Lib "Kernel" (ByVal
  lpApplicationName As String, lpKey-
  Name As Any, lpString As Any,
  ByVal lpFileName As String)
  As Integer
```

but the correct declaration is

```
Declare Function WritePrivate
  ProfileString Lib "Kernel" (ByVal
  lpApplicationName As String, ByVal
  lpKeyName As String, ByVal lpString
  As String, ByVal lpFileName As
  String) As Integer
```

because the lpKeyName and lpString arguments (as specified in the Windows SDK) must each be a pointer to a string. The other declarations I got from the help file were correct, but because writing to .INI files is a commonly used function, I felt it was important to point out this error. If you have any additional questions about the program itself, take a look at the source code, which is heavily commented.

RecEdit unmask the mysterious .REC format and hands new power to Windows macro mavens. With RecEdit, the Windows Recorder becomes a much more powerful tool. □

Gregory A. Wolking is the primary sysop of the Utilities/Tips Forum on PC MagNet.

GUIDE TO OUR UTILITIES

ABOUT RECEDIT...

DESCRIPTION RecEdit lets you edit macro files created by the Windows 3.1 Recorder accessory. It eliminates the need to rerecord a macro if you make a mistake while recording or wish to change a complex existing macro. RecEdit lets you cut and paste events from one macro to another, combine .REC files, and even create your own .REC files from scratch.

SETUP To install RecEdit, simply place the RECEDIT.EXE and RECEDIT.HLP files in a directory of your choice. Since RecEdit is a Visual Basic application, it also requires the files VBRUN300.DLL and CMDIALOG.VBX in your \WINDOWS\SYSTEM directory. You may also want to create a Program Manager icon for RecEdit.

Use the File | Open command to load a .REC file for editing. If you use Program Manager's File | Run command to execute RecEdit, you may specify the name of a .REC file on the command line so that RecEdit starts with that file already loaded into memory.

FILES FOR DOWNLOAD

RECEDIT.EXE—The executable program file for RecEdit.
RECEDIT.HLP—The help for RecEdit.
RECEDIT.TXT—The documentation file.
RECEDIT.ZIP—All the source, program, and documentation files.

REMARKS RecEdit provides full context-sensitive help. If you're ever in doubt as to what actions are available to you, press F1 to view a help screen that is relevant to the current situation. You can also get a good overview of RecEdit's functions and capabilities by selecting Contents from the Help menu, selecting a topic, and then using the browse buttons at the top of the help window to walk through any related topics.

SUPPORT Help for the free utilities offered by PC Magazine can be obtained electronically in the Utilities section of ZD Net's Utilities/Tips Forum (GO ZNT:TIPS). The authors of current utilities generally visit this forum daily. You may find an answer to your question simply by reading the messages posted in the forum. If the author is not available and the forum sysops can't answer your question, the Utilities column editor, who also checks this forum each day, will contact the author for you.

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PC Solutions

TIPS AND TECHNIQUES TO INCREASE YOUR PRODUCTIVITY

User-to-User

By Neil J. Rubenking

Moving TrueType Font Files

Moving TrueType fonts to a different location on your disk takes some work, because Windows uses two types of files to track each font: the .TTF file (the font itself) and the .FOT file that contains the information about where the corresponding .TTF file is located. You can't modify the information in a .FOT file directly, so you have to do all the grunt work yourself. Here's the procedure.

- Copy all .TTF files from \WINDOWS\SYSTEM to the new directory.
- Use Control Panel's Fonts applet to remove all of your TrueType fonts. That is, highlight the TrueType fonts and press the Remove button. But don't check the Delete Font File From Disk box—leave the .TTF files in \WINDOWS\SYSTEM until you're absolutely sure that everything is working right. And take care not to remove any fonts that aren't TrueType fonts.
- Now delete any .FOT files that remain in the \WINDOWS\SYSTEM directory. When you install a new font, Control Panel creates the necessary .FOT file in the \WINDOWS\SYSTEM directory using the same base name as the corresponding .TTF file. If, however, an .FOT file already exists with that name (due to, say, a failed program installation), Control Panel will create a new .FOT file by modifying the base name, so you end up with two (or more) .FOT files with similar names, only one of which is actually in use.

When you remove (uninstall) a TrueType font, Control Panel automatically deletes the .FOT file, but only the copy that it's actually using. So if you have any .FOT files left over in \WINDOWS\SYSTEM after uninstalling all of your TrueType fonts, those .FOT files are simply wasting disk space. In fact, if you should find any .FOT files in \WINDOWS\SYSTEM that are not specifically mentioned in the [Fonts] section of WIN.INI, it's safe to delete them outright.

- Return to the Control Panel's Fonts applet, click on the Add button, and select the new directory for the font in the directory list box. The upper box should fill with a list of all the fonts that you just removed. Click the Select

All button, uncheck the Copy Fonts to Windows Directory check box, and then click OK. This takes care of creating new .FOT files, all of which point to your new fonts directory. Moving the .FOT files, though, must be done manually.

- Copy all of the .FOT files from \WINDOWS\SYSTEM to your new fonts directory.
- Open WIN.INI (in NotePad, for example) and find the [Fonts] section. Each line in the [Fonts] section is of the form:

```
English font name=filespec.fot
```

You need to edit the text to the right of the Equal sign to reflect the full path to the .FOT files, as in:

```
English font name=d:\WINDOWS\FONTS\
filespec.fot
```

Note that you should do this only for files with an .FOT extension and of those, only for those you actually copied to your new fonts directory. When you're done, restart Windows so the changes will take effect.

- Now check the results: Open the Fonts applet again and select each font to make sure it appears as it should in the Sample window. If you inadvertently missed a .TTF file, it's usually pretty obvious, because Control Panel will show the default Arial font if the correct file is not present in the directory specified in the .FOT file.

- After testing is complete, you can delete both the .TTF files and the newly created .FOT files from your \WINDOWS\SYSTEM directory. It's a good idea, though, to double-check first that all of those files exist in both directories. Pay particular attention to the .TTF files—Control Panel can always rebuild an .FOT file from scratch, but once you lose a .TTF file, that font is gone for good.

You'll have to repeat the latter part of this process (moving the .FOT files) each time you add a new TrueType font to your system. As we noted, you can prevent Control Panel from moving the .TTF file from the target directory by clearing the "move font to Windows directory" check box when you install it, but there's no way to prevent Control Panel from creating the .FOT file in the \WINDOWS\SYSTEM directory. You'll just have to

HIGHLIGHTS



HARDWARE If you have to put a CD-ROM down somewhere, and you don't have the case, which side should face down? Page 292



OPERATING ENVIRONMENTS

How to set up your system so that you can dual-boot between Windows 95 and OS/2 Warp. Page 297



DATABASES A function that lets you change the Microsoft Access caption in the title of your custom application. Page 311

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move the .FOT file manually and edit WIN.INI to reflect its new location.

GREGORY A. WOLKING,
Orlando, Florida

PC MAGAZINE: There's little I can add to such a complete description of the process required for moving TrueType font files, except for a few tips to make various steps easier. To copy the .TTF and .FOT files from the system directory to your new location, navigate to the System directory in File Manager and choose Sort by Type from the View menu. The file list will be sorted by file extension. Click on the first file with the desired extension and Shift-click on the last one; this will select all files with the chosen extension. Hold down the Ctrl key while you drag the marked files to their new location. File Manager's default behavior when you drag files from one directory to another on the same disk is to move the files. Holding down Ctrl tells it to make a copy instead.

If you have a lot of fonts on your system, selecting only the TrueType fonts in the Control Panel Font applet can be awkward. Click on the font list and press Shift-F8 to enter what Microsoft calls Add mode. Now try the up and down arrows—instead of moving the highlight, they move a hollow selection rectangle. Pressing the Spacebar toggles the highlight on or off for the current item. Just arrow down through the list and press the Spacebar to select each TrueType font. You can use the same technique in almost any multiple-selection list box in a Windows program.

To make the necessary change to the .FOT file paths in WIN.INI, load WIN.INI into Write, not NotePad. When you're asked about converting the file to Write format, click on No Conversion. Locate the [Fonts] section and find the TrueType fonts—they should all be in a group at the end of this section. If they're not, cut and paste to move them so they're in a continuous group with no non-TrueType fonts among them. Highlight all of them and choose Replace from the Find menu. Put an Equal sign followed by the current directory name of the .FOT files in the Find What line; for example, =C:\WINDOWS\SYSTEM\ . If no directory name appears, just put a single Equal sign in the Find What line. In the Replace With line, put an Equal sign followed by your new directory; for example, =C:\WINDOWS\TRUE-TYPE\ . Press the Replace Selection button, then press Close and save the file.

The Windows System directory is the repository for hundreds of .DLLs, .VBXs, .DRVs, and other shared system files. Clearing the TrueType fonts out of this directory can make it easier to track other files that can't be moved and easier to keep track of your fonts as well.

Ignoring Case in Batch File Parameters

Current versions of DOS set the ERRORLEVEL when you run FIND.EXE, with values depending on the results of FIND's text search. I've discovered that you can put this feature to good use to solve the problem of identifying parameters that may be typed in upper, lower, or mixed case. I've created a batch file (shown in Figure 1) that illustrates the technique.

WILLIAM A. MUELLER,
Dedham, Massachusetts

PC MAGAZINE: This excellent technique relies on two features added to FIND.EXE in recent DOS versions. First, the /i switch tells FIND to search for the specified string without regard to case, so a search for "magazine" would find MAGAZINE, Magazine, mAgAzInE, and so on. Second, modern versions of FIND set the DOS ERRORLEVEL if the specified string is not found. I added a test to the example batch file so you can double-check that your particular system's FIND.EXE supports both of these features. Run PARAMS.BAT with no parameters to test your version of the FIND command.

You can download this batch file from PC MagNet's Utilities/Tips Forum.

```
@ECHO OFF
ECHO This batch file demonstrates a technique for comparing a parameter
ECHO against a particular string without regard for upper or lower case.
ECHO.
ECHO Pass NO parameters to test your DOS version's FIND command -or-
ECHO Pass a string starting with "/T" or "/t" -or-
ECHO Pass the string "/RUN" in any combination of upper/lower case
ECHO.
IF NOT '%1'=='' GOTO GotParam
ECHO Now testing your DOS version's FIND command:
ECHO.
ECHO /T|find /i "/t">NUL
IF ERRORLEVEL 1 GOTO Fail
ECHO /T|find /i "/r">NUL
IF NOT ERRORLEVEL 1 GOTO Fail
ECHO FIND performed correctly.
ECHO.
GOTO End

:GotParam
:: Branch if %1 begins with /T or /t, e.g. /TEST, /test, /testit!, etc.
:: Note the caret added before the %1 and before /t
echo ^%1|find /i "^/t">NUL
IF NOT ERRORLEVEL 1 GOTO test

:: Branch if %1 is /run in any case, e.g. /RUN, /Run, /run, etc.
:: Note the carets surrounding %1 and surrounding /run
echo ^%1^|find /i "^/run^">NUL
IF NOT ERRORLEVEL 1 GOTO run

ECHO Your parameter was not "/run", nor did it begin with "/t"
GOTO End

:run
ECHO You chose "/run"
GOTO End

:test
ECHO You chose "/t"
GOTO End

:Fail
ECHO FIND did not set the ERRORLEVEL correctly.
VER
:End
```

FIGURE 1: PARAMS.BAT demonstrates the use of the FIND command in checking for batch file parameters without regard to upper- or lowercase.





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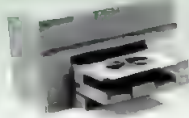
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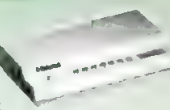
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Two Sides to the Question



The advice you gave in "Shine Your CDs" (*Solutions*, May 16, 1995) is mostly correct, except that the data is on the label side of the disc, not the shiny side. I found this out the hard way when I marked a new audio CD by scratching my initials on the label side. I'm sure the neighbors heard my shriek when I realized I had trashed half of my new CD!

RANDAL PICK, via the Internet

In the *Solutions* item "Shine Your CDs," the information was not accurate. The data on a CD is just under the label, and laying a CD down on that side quite simply is asking for trouble. While it's true that smudges or scratches on the clear, shiny side tend to cause skipping on audio CDs and loss of data on computer CDs, that side can quite effectively be cleaned, as you noted. But a scratch only a few thousands of an inch deep on the label side is

essentially irreparable. (I'm a broadcast engineer and frequently have to clean CDs after the DJs have handled them.)

SAM ASHTON, via CompuServe

PC MAGAZINE: These are but two of the many responses I received to the *Solutions* item offering face-up/face-down advice about CDs. There are at least two sides to the matter.

I think it's safe to say that there's agreement on one point: The best solution is simply to avoid putting an uncovered CD down at all. Put it in a caddy or a jewel case, or even a Tyvek sleeve for a 5.25-inch floppy disk (remember them?) or a business envelope; just don't put it down naked on a hard surface.

Now the question is, when you disobey the edict in the preceding paragraph, should you place the label side down or the shiny side down? There appears to be a genuine difference of opinion on the topic. I made several calls to CD manufacturers, and here's what I discovered.

The data is indeed recorded near the top of the CD. A CD starts out as a thick disc of clear polycarbonate plastic (if I can charac-

terize 1.2 mm as thick), and the data is recorded as a series of pits on the top surface of that disc. The top is then covered with a thin, shiny coat of aluminum that, in turn, is protected with a thin coating of lacquer. The label is then printed in ink on top of the lacquer. The laser shines through the bottom clear layer to read the data that is recorded near the top of the disk.

The legions who favor shiny side down do so for a number of good reasons. Minor scratches and smudges on the polycarbonate bottom side probably won't affect the reading of data, since the lens that senses the laser is actually focused on the far surface of the disk. As one source put it, it's like looking through a window screen at the view outside: The wires in the screen may blur your vision, but they don't obscure it. You can polish more serious scratches out of the bottom side to restore "lost" data. Perhaps the most compelling argument for shiny side down is the fact that a scratch on the label side that penetrates the thin ink, lacquer, and aluminum layers will damage the data pits and obliterate that data permanently.

On the other hand, the polycarbonate plastic is more prone to scratching than the harder lacquer layer, so the label-side-down enthusiasts definitely have a point. And

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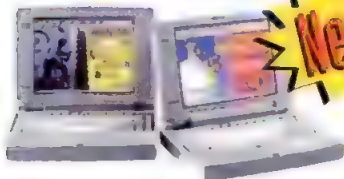
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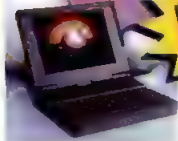
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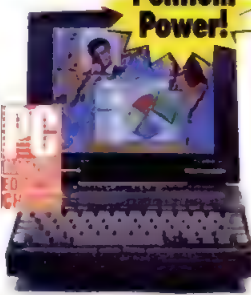
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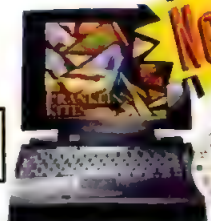


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#17

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Microsoft Windows 95

"We recommend 16MB of RAM (for Windows 95), particularly if you plan to run multiple applications."
... PC Magazine, May 16, 1995

"Adding memory is easiest way to speed hard disk performance in your system."
... Windows Sources Magazine, April 1995

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Memory Lane

I have a 386/33 PC with 8MB of memory and an ISA bus. I also have an ancient ISA memory board with 4MB installed that I salvaged from an old AT. I've been wondering whether I could add this to my 386 and use it as a RAM disk. If so, it would be faster than my hard disk, and setting it up to hold temporary files in Windows would make sense. Is this possible?

ROBERT REITHNER, JR.,
Hoboken, New Jersey

PC MAGAZINE: The idea of making good use out of an older piece of equipment is certainly appealing (especially if you think about how much that board cost when you purchased it), but it's not really a workable idea. Assuming you could install the board and get it to work (given the slower speed of older memory chips), it's unlikely you would be able to specify that particular bank of memory as your RAM disk. And crunching the numbers takes the rest of the steam out of this idea.

The ISA bus is 16 bits wide and runs at 8 MHz. (On your 33-MHz system, it's possible that the bus is actually running at a rate fractionally faster than this, but not enough to have an impact on the results.) The ISA bus has a theoretical maximum data transfer rate of 5 to 8Mb per second, though you rarely see performance this fast.

Early MFM and RLL hard disks had relatively slow maximum data transfer rates of about 600Kb per second and 900Kb per second, so the ISA bus could easily keep up with them. ESDI drives had rates between 1Mb per second and 3Mb per second, and an IDE drive with a 16-bit interface can effectively reach the AT bus 8Mb-per-second maximum. SCSI drives can manage up to 5Mb per second, and SCSI-2 is designed for 10Mb per second or faster. So unless you have an older drive, chances are that it is already just about as fast as a RAM disk running on your 16-bit memory card.

A better bet would be to sell the card and its memory and use the money to add more system memory, if your motherboard can take

it. Another 4MB or 8MB of system memory should certainly help Windows performance, and you could also cache more of your hard disk in the faster system memory. This is a better investment than trying to get the old board to work.—*Alfred Poor*

OPERATING ENVIRONMENTS

Dual-booting OS/2 Warp and Windows 95



One question I still have in the OS/2 Warp versus Windows 95 debate is whether or not I can use a dual-boot feature (OS/2 Warp's or Windows 95's) to switch between the two. There is only one right way to make a real choice between the systems—hands on.

Can I somehow set up my computer now with OS/2 Warp's dual boot in preparation for Windows 95, so that I don't have to repartition my hard disk again? Just how would I accomplish this?

JOEL D. CLARK, via the Internet

PC MAGAZINE: Investing in a large hard disk really pays off in situations like this. As long as you have the space, you can directly compare the two platforms on your own system. You have the sequence right: You need to install OS/2 Warp first. When doing so, set aside a partition that you will use for Windows 95.

When you install OS/2 Warp, you are asked which partition you want to put it on. If you say you want to change the drive, the FDISK utility appears, allowing you to create a Boot Manager partition. If you already have OS/2 Warp installed, you can run FDISKPM to create the Boot Manager partition and make it startable. The startable partition is the one that takes control when you first turn on your computer.

The partition setup I'm using at the moment is shown in Figure 2. I like to keep programs and data separate from the operating system, so I have an additional HPFS

partition for OS/2-only applications and another FAT partition for programs I may run under either OS/2 or Windows 95. Note that OS/2 Warp is quite flexible and doesn't object to being installed in the E: partition.

When you install Windows 95, it will disable Boot Manager. That's necessary so that the installation program can be sure to take control when it needs to reboot your system to complete the installation process. When Windows 95 is installed, click on Start/Run and type FDISK. From the FDISK options menu, select 2 to set the active partition.

You will see a partition list similar to that in Figure 3. The 2MB partition at the bottom is Boot Manager. (Remember that D:, E:, and F: are hidden with the extended partition.) Type the partition number that corresponds to Boot Manager, and the A under Status will move to that partition. Now hit Esc, save your changes, and then reboot. Boot Manager will take control and allow you to choose between Windows 95 and OS/2 Warp.

Warning: If you already have Windows 3.11 installed and are using the red-label version of OS/2 Warp, that copy of OS/2 Warp relies on

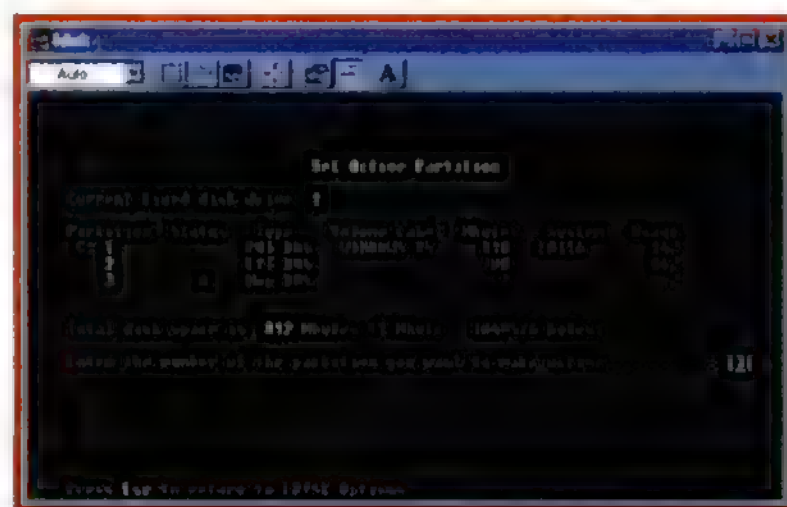


FIGURE 3: After you've installed Windows 95, use the FDISK utility to make the Boot Manager partition the active partition.

Windows 3.11 to run Windows applications. If you install the upgrade version of Windows 95 on top of Windows 3.11, you'll lose your Windows application support under OS/2 Warp. Either use the Fullpak or Connect versions of Warp, or use the full version of Windows 95 in a separate partition.—*Brian Proffitt*

Fixed Disk Utility				
Options Help				
Partition Information				
Name	Status	Access	File System Type	MBytes
Windows95	Bootable	C:Primary	FAT	110
	None	D:Logical	FAT	449
OS/2Warp	Bootable	E:Logical	HPFS	60
	None	F:Logical	HPFS	190
	Startable	:Primary	BOOT MANAGER	2

FIGURE 2: The hard disk represented here is partitioned to allow either OS/2 Warp or Windows 95 to boot. Note that drives have been set up to accommodate both OS/2's HPFS file system and Windows 95's FAT file system.

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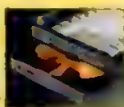
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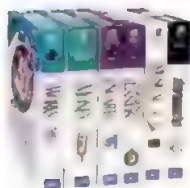
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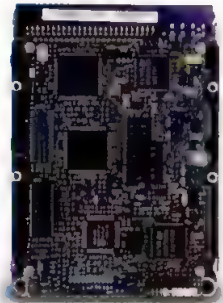


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What to Do About Windows .TMP Files

*I'm really confused by Windows 3.1 .TMP files. When I search using the *.TMP mask in File Manager, it finds over 70 files on my disk. By looking at their names, I can tell what application created them, and if I rename one of these files so that its name is recognized by the original application, that application can open the renamed file as if it were a normal file. For example, I renamed ~PM53424.TMP to DUMB.PM5, and Aldus PageMaker 5.0 had no problem opening the file.*

If I keep this search window open in File Manager, switch to Program Manager, and then open PageMaker 5.0 and return to File Manager, File Manager notifies me that the contents of the drive have changed. When I update the search results, I find that another ~PM5XXXX.TMP file has been created. When I quit PageMaker, this file is automatically deleted.

Microsoft Undelete generally recognizes .TMP files that have been deleted and, in some

It's never appropriate to open, modify, or delete a .TMP file while the program that created it is running.

cases, allows you to recover them. It's all very confusing, and I'd like to know what the .TMP files are for and whether I can delete them.

CARLO M. CONTRERAS, via the Internet

PC MAGAZINE: Rule number one: When Windows is running, leave the .TMP files alone! The reasons for creating .TMP files vary with different applications, but it's never appropriate to open, modify, or delete a .TMP file while the program that created it is running. When the program doesn't need the .TMP file anymore, it should automatically delete it. And of course, when you terminate the program, it should delete all the .TMP files it has been using.

Rule number two: When Windows is not running, delete any .TMP files you can find. When a program ends, it should delete any temporary files it created, but if a program terminates abnormally, or if another program manages to crash the system, .TMP files may remain on your disk. If you find .TMP files after exiting Windows, you can freely delete

them. They're just using up valuable disk space. The only time you might want to hold off for a bit is immediately after a system crash that destroyed the files you were working on. In that case, examine the .TMP files right away and rename any that seem to contain data from the destroyed files. Then delete the rest.—Neil J. Rubenking

WORD PROCESSING

Using Logos and Letterheads in WordPerfect



We use WordPerfect for Windows 6.0a on our LAN. The company logo is in one 200K .WPG file, and our letterhead is in another file. After the logo and letterhead are inserted, the simplest memo is 250K. Is there any way users can save only the text of their letters but still have the logo and letterhead print?

DAVID WOJCIECHOWSKI,
via CompuServe

PC MAGAZINE: There are at least two ways to add a logo and letterhead in WordPerfect for Windows without having to save duplicate copies of both with each memo or letter: You can use the Document merge command, or you can set up your memos and letters as master documents.

You'll find the Document merge command in every version of WordPerfect back to at least WordPerfect for DOS 5.1 (which is as far back as I checked). Master documents are also available from WordPerfect 5.1, although the details for using these features vary slightly from one version to another. For simplicity, I'll give step-by-step instructions only for Version 6.0a. (The slight adjustments you'll have to make for earlier releases should present no problem.) I'll also assume that you've put both logo and letterhead in one file, called LOGOLETR.STD, and that it's on the network drive G: in the \WP-FILES directory.

To insert the LOGOLETR.STD file with the Document merge command in WordPerfect for Windows 6.0a, open a blank file and choose Tools | Merge to bring up the Merge dialog box. Choose Form, then None when WordPerfect for Windows asks you to specify a data file, and then choose OK. WordPerfect will return you to your blank document, with the merge feature bar showing.

Make sure your cursor is at the beginning of the file and choose Merge Codes from the merge feature bar to open the Insert Merge Codes dialog box. Highlight Document(filename) and choose Insert. Then enter the drive, path, and filename to insert and choose

OK. WordPerfect will then insert the code

DOCUMENT(G:\WPFILES\LOGOLETR.STD)

in your document. Just move your cursor past the code, add a carriage return, and start your memo or letter.

When you're ready to print, you must use the merge command rather than the print command. Choose Tools | Merge, then Merge to open the Perform Merge dialog box. Set the Form File text box to <current document>, leave the Data File text box blank, set the Output File text box to <Printer>, and choose OK. WordPerfect will merge the logo and letterhead into your printed output.

To insert the logo and letterhead in a master document instead, start with a blank document and choose File | Master Document | Subdocument to open the Include Subdocument dialog box. Enter the appropriate drive, directory, and filename, and choose Include. Depending on current settings, either WordPerfect will add a small icon at the left margin of the page (to indicate the subdocument) or it will add the following marker:

Subdoc: G:\WPFILES\LOGOLETR.STD

Here again, simply add a carriage return and start your memo or letter. When you're ready to print, you'll need to expand the master document so you can see and print the subdocument. Choose File, Master Document, Expand Master. Make sure the check box for the subdocument is checked and choose OK. You can then give the usual File Print command. When you save the file, WordPerfect will ask whether you want to condense it. Answer yes to save the file without saving an embedded copy of the logo and letterhead.

To give you a sense of how much space you can save, I ran a couple of tests with a logo-plus-letterhead file of 15.7K. Inserting the logo in a master document with one line of text and then saving the document without condensing it gave me a 16.3K file. Condensing the master document dropped the size to 2.5K. Using the Document merge command instead yielded an even smaller file—just over 1K. As should be obvious, either approach will save a great deal of disk space, but the Document merge command will save just a bit more.—M. David Stone

More on Inserting Merge Fields in WinWord 6

In the Solutions column of June 13, 1995, Dennis J. Varnau pointed out that if you choose the Insert Merge Field button on Word's Mail Merge toolbar and there are too many fields to

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CD ROM DRIVES

Model	Capacity	Interface	Seek	RPM	Cache	Int.
CHINON	COA525 Dual Speed SCSI	155	215			
SONY	CDU-55i Dual Speed SCSI	195	255			
SONY	CDU-55e Dual Speed IDE	145	n/a			
NEC	3Xp+ SCSI	n/a	375			
TEAC	CD-55 QuadSpeed IDE	185	n/a			
NEC	4Xe SCSI	n/a	449			
PLEXTOR	4Plex SCSI	335	435			
TOSHIBA	QuadSpeed SCSI	355	415			
PLEXTOR	6Plex SCSI	535	635			
NEC	6Plex SCSI	495	595			

SCSI ADAPTERS

Model	Capacity	Interface	Seek	RPM	Cache	Int.
Adaptec	1522A ISA to Fast SCSI2 adapter 1080 Cnt	145	285			
Adaptec	1522K ISA to Fast SCSI2 adapter 1080 Cnt	145	285			
Adaptec	2742A HSC based ISA Fast SCSI 2 30 Bt	260	360			
Adaptec	2742K HSC based ISA Fast SCSI 2 30 Bt	260	360			
Adaptec	2742W HSC based ISA Fast SCSI 2 30 Bt	260	360			
Adaptec	1640K Ultra Micro Channel Fast SCSI 2	295	395			
Adaptec	2940K Ultra PCI SCSI Master Controller	315				
DTC	2280 of PCI	29				
DTC	2290 ISA to IDE SCSI	120				
DTC	2270V SCSI 2 VL Bus PDSHD	113				
DTC	2260AS SCSI 2 4-700	120				
DTC	2270AS SCSI 2 4-700	120				
DTC	2270AS SCSI 2 4-700	120				

All SCSI controllers come complete for
QUICK AND EASY installation!

MODEMS

Model	Capacity	Interface	Seek	RPM	Cache	Int.
Robotics	Sportster Int/Ext	105/125				
Robotics	14.4bps Data/fax with QL II	225/245				
Robotics	V.34 28.8 bps with fax	185				
Robotics	Sportster Int	185				
Robotics	V.34 PCMCIA 14.4bps	346				
Robotics	V.34 PCMCIA 28.8 bps	385/465				
Robotics	Courier Int/Ext	385				
Robotics	V.34 28.8 bps with fax	385				
Robotics	Courier Int	445				
Robotics	V.34 PCMCIA 14.4bps					
Robotics	Courier Int					
Robotics	V.34 PCMCIA 28.8 bps					
Hayes	ACCURA14.4 Int/Ext	95/115				
Hayes	14.4bps Data/fax	170/215				
Hayes	28.8 bps Data/fax Async	285/345				
Hayes	OPTIMA14.4 Pocket/Ext	345/395				
Hayes	14.4bps Data/fax					
Hayes	28.8 bps Data/fax Async					
Hayes	PM1440HCIV332 Int/Ext	95/105				
Hayes	14.4bps Data/fax Async	180/210				
Hayes	PM288HCIV34 Int/Ext					
Hayes	28.8 bps Data/fax Async					

OPTICAL DRIVES

Model	Capacity	Interface	Seek	RPM	Cache	Int.
Fujitsu	230 MB SCSI	M2512	30ms	525	585	
Fujitsu	230 MB PC	DynoMo*	30ms	n/a	725	
Fujitsu	230 MB	DynoMo	30ms	n/a	725	
Fujitsu	1.3 GB SCSI	HP17167	23.5ms	2195	2295	
Fujitsu	1.3 GB SCSI	Tahiti III	18ms	2295	2395	

1 free cartridge with each optical drive purchased!

SCANNERS

Model	Capacity	Interface	Seek	RPM	Cache	Int.
Nikon	Scantouch	1299				
Nikon	Transparency Adapter	599				
Nikon	Super Coolscan	1499				
UMAX	UC630/1260	675/1240				
UMAX	Viata-S6	780				
UMAX	Powerlook	3250				

SCSI HARD DRIVE CABINETS

Model	Capacity	Interface	Seek	RPM	Cache	Int.
Desqcb	5.25" or 3.5" half ht open/closed bezel HD enclosure	575				
Desqcb	3.5" half ht open/closed bezel HD enclosure	575				
Desqcb	Full Height Cab 5.25" full height cab	\$139				
Desqcb	Multi Bay Cabinets 5.25" and 3.5" cabinets available	\$CALL				

Two, four, six, and eight bay cabinets available. All cabinets come with a 25-50 pin Mac system cable and a power cable. 1 year warranty on all cabinets.

SCSI & IDE HARD DRIVES

Model	Capacity	Interface	Seek	RPM	Cache	Int.
Seagate	Hawk 2LP	1.2 GB	9.5ms	5400	512K	\$475
Seagate	Hawk 4	4.2 GB	9ms	5400	512K	1125
Seagate	Barracuda	2.4 GB	8ms	7200	1024K	970
Seagate	Barracuda	4.2 GB	8ms	7200	1024K	1425
Seagate	Barracuda Wide	2.4 GB	8ms	7200	1024K	1085
Seagate	Barracuda Wide	4.2 GB	8ms	7200	1024K	1525
Seagate	Elite	9.0 GB	11ms	5400	512K	2320
Seagate	ST3491A	420 MB	14ms	3800	120KB	155
Seagate	ST3660A	540 MB	14ms	3800	120KB	170
Seagate	ST3850A	850 MB	12ms	4500	120KB	230
Seagate	ST31220A	1.2 GB	12ms	4500	120KB	275

External SCSI units add \$60 comes complete with cables!

SPECIALS

Quantum 340MB SCSI 11ms seek, 4500 RPM.....	\$135.00
Quantum 540MB IDE 10ms seek, 4500 RPM.....	\$180.00
Seagate 1GB IDE 12ms seek, 5400 RPM.....	\$275.00
Fujitsu 1.06GB SCSI 10ms seek, 5400 RPM.....	\$375.00
Amquest 28.8bps internal V.34 fax/modem.....	\$175.00
TEAC Quad Speed CD Rom IDE 195ms access.....	\$185.00

CONNER

Model	Capacity	Interface	Seek	RPM	Cache	Int.
Conner	CFP1080	1.06 GB	10ms	5400	256K	395
Conner	CFP2105	2.0 GB	8.5ms	5400	512K	785
Conner	CFP2107	2.1 GB	8.5ms	5400	512K	910
Conner	CFP4207	4.2 GB	9ms	7200	512K	1125
Conner	CFS425	425 MB	14ms	3400	64KB	150
Conner	CFS450	540 MB	14ms	3600	64KB	175
Conner	CFS450	850 MB	14ms	3600	64KB	235
Conner	CFS1275	1.2 GB	14ms	3600	64KB	295

External SCSI units add \$60 comes complete with cables!

Quantum

Model	Capacity	Interface	Seek	RPM	Cache	Int.
Quantum	Traillblazer	420 MB	11ms	4500	128K	155/170
Quantum	Fireball*	740 MB	10ms	5400	128K	180/185
Quantum	Lightning	530 MB	11ms	4500	128K	195/225
Quantum	Traillblazer	850 MB	11ms	4500	128K	235/270
Quantum	Fireball*	1080 MB	10ms	5400	128K	295/335
Quantum	1.2 GB	SCSI	8ms	7200	1024K	879
Quantum	Grand Prix	4200 MB	8.6ms	7200	512K	1035
Quantum	Atlas	4.3 GB	8ms	7200	2048K	1415

*Drives with MR Head Technology gives you increased transfer rates
External SCSI units add \$60 comes complete with cables!

- Hard drives from ProDirect include illustrated installation guides & complete setup software.
- Call for specialized brackets and cables for your specific system's needs.
- Always call for the most competitive prices on all hard drives!!!

WESTERN DIGITAL

Model	Capacity	Interface	Seek	RPM	Cache	Int.
Western Digital	WD2540A	540 MB	11ms	4500	64KB	190
Western Digital	WD2850A	850 MB	10ms	4500	64KB	230
Western Digital	WD31200	1.2 GB	10ms	4500	64KB	340
Western Digital	WD3180	1.6 GB	10ms	4500	64KB	595

5 Year Advance Replacement! MICROPOLIS

Model	Capacity	Interface	Seek	RPM	Cache	Int.
MicroPolis	M4221	2.1 GB	8.5ms	7200	512K	865
MicroPolis	M1936	3.6 GB	8.5ms	7200	512K	1225
MicroPolis	M3243	4.3 GB	8.5ms	7200	512K	1295
MicroPolis	M1991	9.0 GB	11ms	5400	512K	2095
MicroPolis	M4221Wide	2.1 GB	8.5ms	7200	512K	965
MicroPolis	M3243Wide	4.3 GB	8.5ms	7200	512K	1395
MicroPolis	M1991Wide	9.0 GB	11ms	5400	512K	2195
MicroPolis	M4221AV	2.1 GB	8.5ms	7200	512K	915
MicroPolis	M1906AV	3.6 GB	8.5ms	7200	512K	1275
MicroPolis	M3243AV	4.3 GB	8.5ms	7200	512K	1465
MicroPolis	M1991AV	9.0 GB	11ms	5400	512K	2295

External SCSI units add \$60 comes complete with cables!

LT Super Capacity Removable Cartridge External Storage

Model	Capacity	Interface	Seek	RPM	Cache	Int.
LT Super Capacity	MD2100	2.1 GB	8.9ms	7200	512K	5 Year
LT Super Capacity	MD4300	4.3 GB	8.9ms	7200	512K	5 Year

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- Factory sealed replacement drives.
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REMOVABLE STORAGE

Model	Capacity	Interface	Seek	RPM	Cache	Int.
SyQuest	88 MB SCSI	20ms	3200	300	360	
SyQuest	200 MB SCSI	18ms	3200	410	470	
SyQuest	270 MB SCSI	13.5ms	3200	420	480	
SyQuest	270 MB IDE	13.5ms	3200	420	n/a	

One free cartridge with each SyQuest drive purchased

NETWORK CARDS & HUBS

3Com

Model	Capacity	Interface	Seek	RPM	Cache	Int.
3Com	ETHERnet III	158/168				
3Com	ETHERnet III	110/125				
3Com	ETHERnet III	478/527				
3Com	ETHERnet III	20/21				
3Com	ETHERnet III	225				
3Com	ETHERnet III	225				
3Com	ETHERnet III	110				
3Com	ETHERnet III	63				

Xircom

Model	Capacity	Interface	Seek	RPM	Cache	Int.
Xircom	CCIPPS	10 Base T				
Xircom	CCIPPS	10 Base T & Coax				
Xircom	CCIPPS	10 Base T				
Xircom	CCIPPS	10 Base T				
Xircom	CCIPPS	10 Base T				
Xircom	CCIPPS	10 Base T				
Xircom	CCIPPS	10 Base T				
Xircom	CCIPPS	10 Base T				

TAPE BACKUP DRIVES

Model	Capacity	Interface	Seek	RPM	Cache	Int.
Quantum	250 MB IDE Jumbo 250 QIC 80	149	n/a			
Quantum	250 MB IDE Tracker 250 QIC 80 Parallel	n/a	275			
Quantum	350 MB IDE Jumbo 350 QIC 80	189	n/a			
Quantum	350 MB IDE Tracker 350 QIC 80 Parallel	n/a	285			
Quantum	700 MB IDE Tracker 350 QIC 3010 Parallel	n/a	325			
Quantum	1.4 GB IDE Jumbo 1400 QIC 3010	399	n/a			
Quantum	1.05 GB SCSI Powertape 1100 QIC525	599	699			

CONNER

Model	Capacity	Interface	Seek	RPM	Cache	Int.
Conner	420 MB IDE	175	n/a			
Conner	850 MB IDE	260	n/a			

EXA BYTE

Model	Capacity	Interface	Seek	RPM	Cache	Int.
ExaByte	4000 SCSI	845	955			
ExaByte	4 GB SCSI	995	1095			
ExaByte	4200 SCSI	1425	1495			
ExaByte	7-14 GB SCSI	2250	2310			

Mountain

Model	Capacity	Interface	Seek	RPM	Cache	Int.
Mountain	330 MB TOS350 QIC-80 IDE	310	n/a			
Mountain	700 MB T0700 QIC-80 IDE	475	n/a			
Mountain	1.0 GB MTN1000 4mm media SCSI	1675	1775			
Mountain	4.0 GB MTN1200 4mm media SCSI	1945	2045			

Quantum DLT SCSI

Model	Capacity	Trans. Rate	Media	Price(Ext)
DLT2000X30GB		2.5MB/sec	DLT20	5295
DLT4000	40GB	3MB/sec	DLT40	6295

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NOTEBOOKS

IBM



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IBM ThinkPad 701C features:

- 10.4" Color Display
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- TrackPoint™ expandable full size keyboard
- TrackPoint III™ integrated pointing device
- Built-in 14.4/4.4 Data/Fax Modem
- Wireless infrared port
- Built-in 16-bit audio
- Super NiCad battery
- 3 Year Manufacturer's Warranty

ThinkPad 701CS 486DX/75MHz	
360MB, 8MB, 10.4" Dual Scan Color	\$3,149
540MB, 8MB, 10.4" Dual Scan Color	3,449
ThinkPad 701C 486DX/75MHz	
360MB, 8MB, 10.4" Active Matrix Color	3,699
540MB, 8MB, 10.4" Active Matrix Color	3,999
ThinkPad 755CSE 486DX/100MHz	
340MB, 8MB, 10.4" Dual Scan Color	3,499
540MB, 8MB, 10.4" Dual Scan Color	3,849
810MB, 8MB, 10.4" Dual Scan Color	4,299
ThinkPad 755C 486DX/100MHz	
340MB, 8MB, 10.4" Active Matrix Color	3,499
540MB, 8MB, 10.4" Active Matrix Color	4,649
810MB, 8MB, 10.4" Active Matrix Color	5,099
ThinkPad 755CSE 486DX/100MHz	
540MB, 8MB, 10.4" Active Matrix Color	\$5,649
810MB, 8MB, 10.4" Active Matrix Color	6,099
ThinkPad 755CV 486DX/100MHz	
540MB, 8MB, 10.4" Active Matrix Color	\$6,099
ThinkPad 755C Pentium® 75MHz	
540MB, 8MB, 10.4" Active Matrix Color	\$5,799
810MB, 8MB, 10.4" Active Matrix Color	6,249

SYSTEMS

IBM



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- Pentium® 75MHz Processors
- 8MB RAM
- 540MB IDE Hard Drive
- PCI Local Bus 64 bit w/2MB DRAM

\$1,823

IBA657635F

IBM PC Models

Processor	RAM/HD	Slots/Bays	Prod. Code	Price
486DX/66 8/364MB	3x3		IBA657114F	\$1,466
486DX/66 8/364MB	5x5		IBA658114F	1,553
486DX/66 8/540MB	5x5		IBA658115F	1,645

IBM Pentium® Models

Processor	RAM/HD	Slots/Bays	Prod. Code	Price
Pentium® 75MHz 8/540MB	3x3		IBA657635F	\$1,823
Pentium® 75MHz 16/540MB	3x3		IBA657635H	2,168
Pentium® 75MHz 16/850MB	3x3		IBA657637H	2,283
Pentium® 75MHz 8/540MB	5x5		IBA658635F	1,890
Pentium® 75MHz 16/540MB	5x5		IBA658635H	2,225
Pentium® 75MHz 16/850MB	5x5		IBA658637H	2,340
Pentium® 90MHz 8/540MB	3x3		IBA657645F	2,225
Pentium® 90MHz 16/540MB	3x3		IBA657645H	2,570
Pentium® 90MHz 16/850MB	3x3		IBA657647H	2,685
Pentium® 90MHz 8/540MB	5x5		IBA658645F	2,283
Pentium® 90MHz 16/540MB	5x5		IBA658645H	2,628
Pentium® 90MHz 16/850MB	5x5		IBA658647H	2,743

NOTEBOOKS

AST



Ascentia 910N

- 486DX/75MHz
- 10.4" Active Matrix Color Display
- 8MB RAM
- 510MB Hard Drive
- 3 Year Mfr's Warranty

\$3,129

AST150-S01

AST Ascentia 910N 486DX/75MHz

170MB, 8MB, 10.4" Dual Scan Color	\$2,489
510MB, 8MB, 10.4" Active Matrix Color	3,129
720MB, 8MB, 10.4" Dual Scan Color	2,855
720MB, 8MB, 10.4" Active Matrix Color	3,319
AST Ascentia 950N Pentium® 75MHz	
500MB, 8MB, 10.4" Dual Scan Color	\$3,269
800MB, 8MB, 10.4" Dual Scan Color	3,549
1.2GB, 8MB, 10.4" Dual Scan Color	4,015
800MB, 8MB, 10.4" Active Matrix Color	4,669
1.2GB, 8MB, 10.4" Active Matrix Color	5,025

HEWLETT® PACKARD

Omnibook 600C 486DX/50MHz	
170MB, 4MB, 8.5" Dual Scan Color	\$2,369
260MB, 4MB, 8.5" Dual Scan Color	2,505
Omnibook 600C 486DX/75MHz	
170MB, 8MB, 8.5" Dual Scan Color	\$2,819
260MB, 8MB, 8.5" Dual Scan Color	2,999

SAMSUNG

SEN5800 Pentium® 75MHz	
520MB, 8MB, 10.4" Dual Scan Color	\$2,799
810MB, 8MB, 10.4" Active Matrix Color	3,299
SEN5800 Pentium® 90MHz	
1.3GB, 8MB, 10.4" Active Matrix Color	\$3,799

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XJack 14.4/14.4 PC Card Fax/Modem	\$179
XJack Cellular 14.4/14.4 Fax/Modem	199
Gold Series 14.4/14.4 PC Card Fax/Modem	209
Combo 14.4/Ethernet PC Card	379
XJack 28.8/14.4 PC Card Fax/Modem	349

SYSTEMS

AST



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- 850MB through 1.6GB IDE Hard Drive
- 8MB or 16MB Memory (128MB MAX)
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Bravo MS-T 100MHz Pentium®

- 100MHz Pentium® Processor
- 8/850MB
- Mid-Tower case

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Processor	RAM/HD	Prod. Code	Price
75MHz Pentium®	8/850MB	501772-701	\$1,729
75MHz Pentium®	8/850MB w/CD	501772-901	1,899
75MHz Pentium®	16/1.2GB	501772-901	2,199
100MHz Pentium®	8/850MB	501774-301	2,099
100MHz Pentium®	8/850MB w/CD	501774-601	2,269
100MHz Pentium®	16/1.2GB	501774-601	2,579
120MHz Pentium®	16/1.2GB	501814-401	2,699
120MHz Pentium®	16/1.6GB	501814-601	2,989
133MHz Pentium®	16/1.6GB w/CD	501814-601	3,159
133MHz Pentium®	16/1.6GB	501815-401	2,809
133MHz Pentium®	16/1.6GB	501815-601	3,099

AST Bravo MS-T Models

Processor	RAM/HD	Prod. Code	Price
100MHz Pentium®	8/850MB	501777-301	\$2,159
100MHz Pentium®	16/1.2GB	501777-601	2,639
133MHz Pentium®	16/1.6GB	501860-801	3,329

NOTEBOOKS

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TOSHIBA

T2150CDS Satellite Pro™

- 486DX/75MHz Processor
- 10.4" Dual Scan Color Display
- 8MB RAM
- 500MB Hard Drive
- Internal Toshiba 2X 5.25" CD-ROM
- 16 bit Sound Blaster Pro™ compatible
- 2 Type II or 1 Type III PC Card slots
- Integrated power supply (No AC Adapter)
- Accupoint™ integrated pointing device
- External 1.44MB, 3.5" Floppy Drive
- 3 Year Mfr's Warranty



\$2,899

MAT2150CDS

T2100 Series 486DX/50MHz

250MB, 4MB, 9.5" Monochrome	\$1,229
T2110CS 486DX/75MHz	
330MB, 4MB, 10.4" Dual Scan Color	\$1,969
T2130CS 486DX/75MHz	
500MB, 8MB, 10.4" Dual Scan Color	\$2,439
500MB, 8MB, 10.4" Active Matrix Color	3,079
T2150CDS Series 486DX/75MHz	
500MB, 4MB, 10.4" Dual Scan Color	\$2,899
500MB, 8MB, 10.4" Active Matrix Color	3,719
Portégé 6100T Pentium® 90MHz	
686MB, 8MB, 9.5" Active Matrix Color	\$4,399
Satellite Pro 400 Pentium® 75MHz	
772MB, 8MB, 10.4" Dual Scan Color	\$3,515
772MB, 8MB, 10.4" Active Matrix Color	4,329



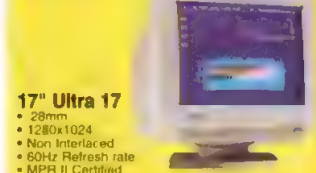
PC CARDS Xircom

Network Combo	\$195
Network RJ-45 or BNC	179

14.4 Fax/Modem PC Card	\$109
14.4 Fax/Modem PC Card w/notebook purchase	99
28.8 Fax/Modem PC Card	239
28.8 Fax/Modem PC Card w/notebook purchase	219

MONITORS

PRINCETON



17" Ultra 17

- 28mm
- 1280x1024
- Non Interlaced
- 60Hz Refresh rate
- MPRI II Certified
- Energy Star Compliant

\$639

CMPGU17

PRINCETON®

14" Ultra 14, 28, 1024x768, N.I. CMPGU14N	\$599
15" Ultra 15, 28, 1280x1024, N.I. CMPGU15	369
17" Ultra 17, 28, 1280x1024, N.I. CMPGU17	639

SONY

14" 1425, 28, 1024x768, N.I. CMSO1425	\$309
15" 155F1, 25, 1280x1024, N.I. CMSE155F1	449
17" 17SF1, 25, 1280x1024, N.I. CM17SF1	899
20" 20SE1, 30, 1600x1200, N.I. CMSE20SE1	1,999

ViewSonic

See The Difference!

15" 15GA, 27, 1280x1024, N.I. CMVSON15GA	\$579
15" 15GS, 27, 1280x1024, N.I. CMVSON15GS	959
17" 17GA, 27, 1280x1024, N.I. CMVSON17GA	959
17" 17GS, 27, 1280x1024, N.I. CMVSON17GS	899
17" 17PS, 28, 1600x1200, N.I. CMVSON17PS	1,089
20" 20PS, 28, 1600x1200, N.I. CMVSON20PS	1,639
21" 21PS, 25, 1600x1200, N.I. CMVSON21PS	1,999

NOTEBOOKS

TEXAS INSTRUMENTS

Extensa 450

- 486DX/75MHz Processor
- 10.4" Dual Scan color display
- 4MB RAM exp. to 32MB
- Removable 340MB HD
- Ergonomical keyboard & palmrest with TouchPad pointing device
- 2 Type I PC Card slot
- Parallel, Serial infrared, PS/2 & Expansion interface
- NiMH battery



\$1,799

TEXT450CS3

TEXAS INSTRUMENTS

Travel Mate 4000 Series DX/75MHz	
4/455MB, 4MB, 10.5" Dual Scan Color	\$2,429
4/524MB, 4MB, 10.4" Active Matrix Color	2,769
Travel Mate 4000 Series DX/100MHz	
524MB, 4MB, 10.4" Active Matrix Color	\$3,429
Travel Mate 5000 Series Pentium® 75MHz	
PC Magazine's Editor's Choice August 1994 "Full Feature Notebook"	
500MB, 8MB, 10.4" Dual Scan Color	\$3,899
772MB, 8MB, 10.4" Active Color	4,519
Travel Mate 5100 Pentium® 90MHz	
1.2GB, 8MB, 10.4" Active Color	\$5,199

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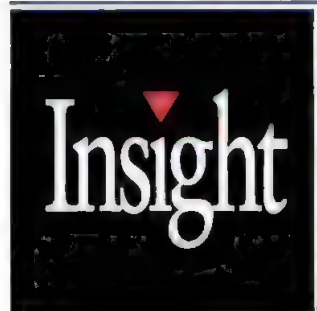
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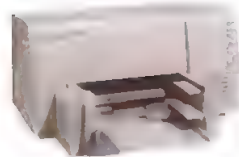
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fit on screen, you can't scroll through the list to find a field. You provided another way to insert a merge field, but there's an easier solution: Pressing Alt-Shift-F gives you a scrollable list of merge fields that you can insert into your document.

EDWARD BRUCE,
Falmouth, Massachusetts

PC MAGAZINE: Thanks for the reminder about this command. When you're in a merge document, the Alt-Shift-F combination brings up the Insert Merge Field dialog box, which includes scrollable lists of both merge-related fields and the names of the Merge Fields for data.

Whether this is easier than the approach I suggested is a matter of opinion, though. I find it easier to enter a field by typing its name than by calling up and scrolling through a list. And I find it a lot easier to remember field names than arbitrary commands like Alt-Shift-F. Granted, the F could stand for Field, but I can never remember whether a given command is Alt-Shift-F, Alt-Ctrl-F, or Ctrl-Shift-F unless I'm absolutely consistent about the Alt, Ctrl, and Shift combinations. On my customized copy of WinWord, for example, I reserve Alt-Shift for styles.

I'd argue that Alt-Shift-F is one of WinWord's hard-to-remember commands precisely because it's available only by way of the keystroke command. Unless you're good at remembering arbitrary keystrokes, it's almost useless. You can make it more useful by changing the keystroke, adding an alternate keystroke, or putting the command in a menu.

The command you need to customize is InsertMergeField, which you'll find in the All Commands category in the Customize dialog box. To add the command to a menu, choose Tools, Customize, then Menus. Next, choose All Commands in the categories list box and InsertMergeField in the Commands list box. By default, WinWord will specify the Tools menu in the Change What Menu text box, (Auto) in the Position on Menu text box, and the name &Merge Field in the Name on Menu text box.

Note that the & indicates the letter that will be the trigger key on the menu—in this case, M. Since the Tools | Macros command uses M, you'll want to change the trigger key for Merge Field so you don't have to choose between Merge Field and Macros when you use keystrokes for menu commands. I'd recommend changing the entry to Merge &Field, since nothing on the Tools menu starts with F.

If you accept the other defaults and choose Add, WinWord will add the command to the Tools menu, just below the Mail Merge command. The F will be underlined to indicate that it's the trigger key (the M key will be underlined if you kept the default). You'll also see the current shortcut key assignment on the menu as a useful reminder.

To change the keystroke or to add an alter-

native, choose Tools, Customize, then the Keyboard tab. Here, too, choose All Commands in the categories list box, and InsertMergeField in the Commands list box. Assuming that the keystroke isn't already customized, WinWord will show Alt-Shift-F as the only entry in the Current Keys list box. If you want to remove this as a choice, highlight it and choose Remove.

To add a new key combination, move to the Press New Shortcut Key text box and type the key combination to be used. I'd suggest a two-key combination using some variation on MF, for Merge Field. If you stay with Alt-Shift for mail merge commands, for example, you can use Alt-Shift-M,F. (By default, Alt-Shift-M is assigned to MailMergeToPrinter, but if you prefer mnemonic keystrokes, you'll need to change that as well—perhaps to Alt-Shift-M,P.)

Don't forget to choose the Assign button before closing the dialog box, or WinWord won't make the key assignment. And don't forget to choose File | Save All when you finish, to make sure your changes get saved to disk.

You'll notice that I did not suggest adding the command to a toolbar. That's because if you do add the command to a toolbar, it installs as another Insert Merge Field button. Instead of opening the Insert Merge Field dialog box, this new button will open the same unscrollable list of merge fields as the original Insert Merge Field button. And that, of course, is the problem we're trying to overcome.—*M. David Stone*

SPREADSHEETS

Excel's Scrolling Region



On most of my Microsoft Excel 5.0 spreadsheets, I can get to the bottom of my entries by dragging the scroll box to the bottom of the scroll bar. On one of my sheets, however, this action takes me to row 1776, even though my bottom-most entry is in a row in the 800s. I assumed (and confirmed with trial) that I had entered and deleted an item in this part of the sheet. Is there a way to tell Excel that by using the scroll bar, I want to get to the bottom of my current entries, not all of the past entries?

DAVID MORGAN, via CompuServe

PC MAGAZINE: Just save your file. For scrolling purposes, Excel keeps track of the bottom-right corner of the populated area of your worksheet. When you drag the scroll box to the bottom or right side of the scroll bar, that last populated cell is where you land. (If you want to scroll into unpopulated territory, hold down the Shift key while you drag the box.)

When you erase the bottom-right cell or delete its row or column, Excel doesn't bother to update its scrolling pointers. But it does update them whenever you save. Thus a

simple Ctrl-S will keep the scrolling behavior as you want it.—*Craig Stinson*

Eliminating an Unnecessary Prompt in Excel

One side effect of having a chart on a separate sheet from the data in a Microsoft Excel workbook (rather than embedded in the worksheet) is that, whenever the workbook is opened, Excel thinks it has been changed. The workbook can't be closed—even immediately—without producing the question, "Save Changes in 'MYFILE.XLS'?" It's a bit ironic, and possibly confusing, that this prompt appears even when the workbook is stored in a read-only file. To avoid the prompt, I added the following macro to a module in the workbook:

```
Sub Auto_Open()  
    ThisWorkbook.Saved = True  
End Sub
```

This tells Excel that the workbook has already been saved.

DICK OAKLAND, Brandon, Wisconsin

PC MAGAZINE: A spokesperson for Microsoft says this is a known bug. Since it's a fairly innocuous bug, the company hasn't gotten around to fixing it yet. Mr. Oakland's macro handles the problem neatly. Setting the Saved property of the ThisWorkbook object to True clears the file's dirty bit, letting Excel know it's okay to close without prompting for a save.

Usually, when Excel prompts you to save a workbook that you haven't changed, it does so for good reason—because the workbook contains one or more volatile formulas. A volatile formula is one whose value is subject to change on every recalculation. Common examples are formulas involving the NOW () and RAND () functions. When you open such a workbook, Excel recalculates the volatile formulas, and if you close without saving, you get a prompt. If you'd rather avoid the prompt, you can do so with Mr. Oakland's Auto_Open macro.—*Craig Stinson*

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with PCI bus

Tecra 700



- PCI bus architecture (internal & external)
- 11.3" 800x600 high resolution display
- Optional A.C.D. ROM Drive (swap floppies & CD-ROM)
- Multimedia docking station with PCI bus
- Built-in 16-bit sound, microphone, 2 speakers & MIDI
- HUGE 1.2GB hard drives

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Processor	Screen	MB	Price
Pentium 120	11.3" Dual Scan	1.2GB	CALL
Pentium 120	11.3" Active	1.2GB	CALL



Tecra 700

Pentium 75 with Built-in 4X CD-ROM

Satellite Pro 400

- Built-in 4X CD-ROM Drive (Swap floppies & CD-ROM) (Active model only, optional on Dual Scan)
- Pentium 75MHz Processor
- Built-in 16-bit sound, microphone, speaker & MIDI
- 10.4" ActiveX Dual Scan
- Built-in V adapter - small sleek design & reduced weight
- Integrated Accupoint - small, accurate & easy to use
- Lithium Ion battery technology
- Built-in infrared for easy printer connections

Processor	Screen	MB	Price
Pentium 75MHz	10.4" Dual Scan	772MB	\$3539
Pentium 75MHz	10.4" Active	772MB	4359



Satellite Pro 400

Portégé 610CT

Processor	Screen	MB	Price
Pentium 90MHz	9.5" True Color	720MB	\$4359

WIN95
FREE UPGRADE

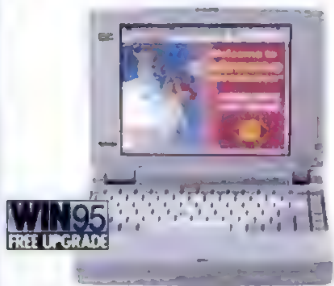
Portégé 610CT



Satellite 2110/2130

- 10.4" Dual Scan & Active
- Built-in AC adapter - small, sleek design & reduced weight
- Integrated Accupoint - small, accurate & easy to use

Processor	Screen	MB	Price
486DX4/75	10.4" Dual Scan	330MB	\$1979
486DX4/75	10.4" Dual Scan	500MB	2459
486DX4/75	10.4" Active	500MB	3059



2130

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NEC Ready Multimedia
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- Super-fast 64-bit PCI local bus graphics
- Built-in MPEG support for full screen, full motion video
- 32-bit PCI IDE controller - fast disk performance
- LOADS of FREE software

Class	Processor	MB	Price
Minitower	Pentium 75	1GB	\$1899
Minitower	Pentium 100	1GB	2299
Minitower	Pentium 100	1.6GB	2699
Minitower	Pentium 120	1.6GB	2999
Minitower	Pentium 133	1.6GB	3299



Versa 2000

Versa 2000

- Lithium Ion battery technology
- VersaGlide touch-pad pointer - simple & accurate
- Built-in, upgradable 14.4 fax/modem (on selected models)
- LOADS of FREE software preinstalled

Processor	Screen	MB	Price
486DX4/75	10.4" Dual Scan	350MB	\$1999*
486DX4/75	9.5" Active	350MB	2299*
486DX4/75	9.5" Active	350MB	2599
486DX4/75	9.5" Active	540MB	2799

*14.4 fax/modem not built-in



Versa 4000

NEC Versa 4000

- Built-in CD-ROM Drive! (Standard on some models, optional on others)
- Pentium 75 and Pentium 90 processors
- 256KB Level 2 Cache to optimize performance
- Unbelievable display - 65K color Dual Scan, 16.8 million color Active (High resolution Active Matrix displays available - 800x600 res.)
- Built-in 16-bit sound, microphone, MIDI and 2 built-in speakers
- Multimedia docking station with outstanding Auto-Launch & speaker array

Processor	Screen	MB	Price
Pentium 75	10.4" Dual Scan	540MB	\$3499
Pentium 75	10.4" Dual Scan	540MB	3799*
Pentium 75	10.1" Active	540MB	3999
Pentium 90	10.1" Active	810MB	4649*
Pentium 90	10.4" High Res.	810MB	4799

* Features built-in CD-ROM drive standard

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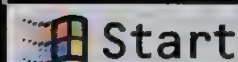
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LTE 5000

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- Built-in 16-bit sound, microphone & 2 speakers
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- Up to 1.35GB hard drives (2.7GB max. capacity)
- Built-in infrared for wireless communications
- Supports NMII & Lithium Ion batteries (up to 8 hrs.)
- Optional MPEG and TV video adapter

Processor	Screen	MB	Price
Pentium 75	10.4" Dual Scan	510MB	CALL
Pentium 75	11.3" Dual Scan	810MB	CALL
Pentium 75	10.4" Active	810MB	CALL
Pentium 90	10.4" Active	810MB	CALL
Pentium 90	10.4" Active	810MB	CALL

*Features Built in CD-ROM drive

Contura 420
as low as
\$2459



Contura 420/430
Product differs slightly from photo.

Contura 420/430

- 10.4" Active & Dual Scan
- Fast 486DX4/75 or 486DX4/100 processors
- Optical trackball -- smoother & more reliable
- High capacity drives -- up to 720MB
- Compaq 3-year worldwide warranty

Processor	Screen	MB	Price
486DX4/75	10.4" Dual Scan	420MB	\$2459
486DX4/75	10.4" Active	420MB	3029
486DX4/100	10.4" Dual Scan	720MB	2839
486DX4/100	10.4" Active	720MB	3499

ProLinea

- Blazing Pentium speed - up to 133MHz Pentium
- BIGGER hard drives -- up to 1GB
- PCI Local bus -- high-speed graphics
- PCI IDE controller -- fast disk performance
- Multiple chassis sizes -- get the expansion you need
- Compaq 3-year worldwide warranty w/ 1st year on-site

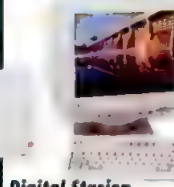
Chassis	Processor	MB	Price
Desktop	486DX2/66	630MB	\$1289
Desktop	Pentium 75	630MB	1589
Desktop	Pentium 90	1GB	2319
Minitower	Pentium 75	1GB	2129
Minitower	Pentium 100	1GB	2399
Minitower	Pentium 133	1GB	3139

Monitors priced separately



ProLinea

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Digital Starion

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- PCI local bus -- high-speed graphics
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- Advanced Telephony -- 14.4 fax/modem, full-duplex speaker phone & answering machine
- Loads of **FREE** software preinstalled

Model	Processor	Screen	MB	Price
Minitower (910)	Pentium 75	850MB	\$1749	
Minitower (915)	Pentium 100	850MB	1999	
Minitower (920)	Pentium 75	1.2GB	2199	
Minitower (930)	Pentium 100	1.2GB	2499	
Minitower (940)	Pentium 133	1.2GB	2999	

Monitors priced separately

HiNote Ultra shown with
Mobile Multimedia Station

HiNote Ultra

- All models 4 lbs. or less -- **ONLY 1.1" thick**
- Built-in sound, microphone & speaker
- Lithium Ion battery technology
- Built-in infrared
- 3-year warranty -- **FREE** 1-year Passport Service
- **NEW Mobile Multimedia Option now available**

Processor	Screen	MB	Price
486DX2/50	9.5" Dual Scan	340MB	\$2549
486DX2/50	9.5" Active	340MB	3079
486DX4/75	9.5" Dual Scan	528MB	3079
486DX4/75	9.5" Active	340MB	3319
486DX4/75	9.5" Active	528MB	3639

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- 16-bit SRS 3-D Amphitheatre Stereo sound
- PCI local bus, high-speed graphics
- Telephone answering system & fax/modem (full-duplex speakerphone on selected models)
- LOADS of **FREE** software

Chassis	Processor	MB	Price
Minitower	Pentium 75	1GB	\$1699
Minitower	Pentium 100	1GB	1979
Minitower	Pentium 133	1.2GB	2359+

+28.8 fax/modem

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- Integrated 4-Disk and sound system
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- Windows 95 keyboard for increased productivity
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- Intel P6 Overdrive processor upgradable

Class	Processor	RAM	Price
Desktop (614)	Pentium 100	850MB	\$2099
Minitower (812)	Pentium 100	1.2GB	2199
Minitower (814)	Pentium 100	1.2GB	2499*
Minitower (818)	Pentium 133	1.6GB	3099*

Monitors priced separately *16MB RAM standard

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**75MHz
Pentium**



**Ascentia
950N**

Ascentia 950N

- 75MHz Pentium - for blazing performance
- 10.4" Active & Dual Scan
- High-res display - 800x600 on notebook
- Built-in 16-bit sound and microphone & speaker
- Lithium Ion battery technology
- Built-in infrared for no-hassle printer connections

Processor	Screen	RAM	Price
Pentium 75	10.4" Dual Scan	500MB	\$3299
Pentium 75	10.4" Dual Scan	800MB	3589
Pentium 75	10.4" Dual Scan	1.2GB	4059
Pentium 75	10.4" Active	800MB	4699
Pentium 75	10.4" Active	1.2GB	5189

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with PCI BUS**



Extensa 550

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- Built-in 16-bit sound, microphone & speaker
- Integrated touchpad pointer
- 10.4" Active Matrix & 10.4" Dual Scan
- Built-in infrared for wireless communications

Processor	Screen	RAM	Price
Pentium 75	10.4" Dual Scan	524MB	2499*
Pentium 75	10.4" Dual Scan	524MB	2999
Pentium 75	10.4" Active	524MB	3599

*CD-ROM Drive is an optional accessory on this model

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5000/5100**

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- 10.5" Dual Scan display with 2MB Video RAM
- 65K colors on notebook display
- 16-bit Sound Card, Speaker, Microphone & MIDI
- 1 perpendic. hard drive - easily add more storage
- Built-in Dual Lithium Ion batteries
- Built-in infrared for no-hassle printer connections

Processor	Screen	RAM	Price
Pentium 75	10.4" Dual Scan	500MB	\$3899
Pentium 75	10.4" Active	772MB	4599
Pentium 90	10.4" Active	1.2GB	5299

Extensa 450

- 10.4" Dual Scan & 9.5" Active display
- GlidePad pointing device
- Advanced battery pro
- Built-in infrared for no-hassle printer connections

Processor	Screen	RAM	Price
486DX4/75	10.4" Dual Scan	340MB	\$1799
486DX4/75	9.5" Active	340MB	2399

PCM 10/95B

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```

'
' Declarations section
'
Option Compare Database 'Use database order for string comparisons
Option Explicit
Declare Function GetParent% Lib "USER" (ByVal hWnd%)
Declare Sub SetWindowText Lib "USER" (ByVal hWnd, ByVal lpstr$)
Declare Function GetActiveWindow Lib "User" () As Integer

*****
' FUNCTION ChangeAccessCaption (Caption As String)      Access 2.0
' Changes the caption in the title bar of the main Access window
*****
Function ChangeAccessCaption (Caption As String)
Dim hWndAccess As Integer

hWndAccess = GetAccessHwnd() ' Get the Access hwnd
Call SetWindowText(hWndAccess, Caption) ' Make the API call

End Function

*****
' FUNCTION GetAccessHwnd ()      Access 2.0
' Returns the handle to the main Access window
*****
Function GetAccessHwnd ()
Dim hWnd As Integer
Dim hWndAccess As Integer
hWnd = GetActiveWindow() ' First get active window handle
hWndAccess = hWnd
While hWnd <> 0 ' Keep getting parents until
    hWndAccess = hWnd ' the parent is 0
    hWnd = GetParent(hWnd)
Wend
GetAccessHwnd = hWndAccess
End Function

```



FIGURE 4: The `ChangeAccessCaption()` function can be used to change the caption in the title bar of the main Access window

feature is not built into MS Access, but with a few Windows API calls, it's easy to do.

You can use the `ChangeAccessCaption()` function listed in Figure 4 in your own code to change the Access window caption. The function uses the Windows API functions `GetActiveWindow()` and `GetParent()` to find the Access main window and it uses the `SetWindowText()` function to change the caption in the title bar.

Note that if another application expects the Access window caption to say "Microsoft Access," you'll confuse it if you change the caption. This is not very likely, however.

ROB MCCORMACK, Thunder Bay,
Ontario, Canada

PC MAGAZINE: I split Mr. McCormack's original code into the two functions listed in Figure 4, and I modified the `ChangeAccessCaption()` function to accept the caption as an argument to the function. To try Mr. McCormack's tip, place the code in a module in your Access database. Be sure to put the code at the top of

the listing in the declarations section of the module and then create the two functions shown in the figure. Then select the View menu, choose Immediate window, and type in the following:

```
? ChangeAccessCaption("My Caption")
```

You can use the Windows API function `SetWindowText()` to change the caption of the main Access window—or of any window, for that matter. To do so, however, you must first get the window's handle, which is the job of the `GetAccessHwnd()` function in the listing. `GetAccessHwnd()` starts by getting the handle to the currently active window (which could be an Access form, for example), then repeatedly calls the `GetParent()` function to get the handle of each successive window's parent until it finds the Access window (the one whose parent window handle is 0). Once you have the handle to the main Access window, changing the caption simply requires a call to `SetWindowText`,

passing it the handle and the new caption.

To change the Access window caption automatically every time you open your database, you can create an AutoExec macro. Access automatically looks for such a macro when it opens a database. If it finds one, it runs it.

To create the macro, open your database, choose the Macro tab in the Database Container, and then choose New. In the Action column, select the first empty cell, then click on the arrow, and choose the RunCode macro action. You can put an explanatory comment in the Comment column if you wish. Then place the insertion point in the Function Name text box at the bottom of the screen and type:

```
ChangeAccessCaption("My Caption")
```

as above. You can, of course, substitute whatever text you want for the "My Caption." Next, select the File menu, choose Save As, and name the resulting macro AutoExec. This tells Access to call the `ChangeAccessCaption` function whenever you open your database. Now close your database. The next time you open it, the caption will be changed automatically.

Users of the Microsoft Access Developers Toolkit needn't go through this procedure. Your application's window caption can be set in the Run Time Options section of the application's .INI file. And you won't need to write any code to set the window caption in Microsoft Access for Windows 95 (in beta as I write this), either. Access 95 has database properties that can be set via a menu option, one of which is Caption.

You can download the code in Figure 4 from PC MagNet. Look for the file CHG-CAPAB in the Sol: Spreadsheets/DBMS Forum on the Utilities/Tips Forum.

—Sal Ricciardi

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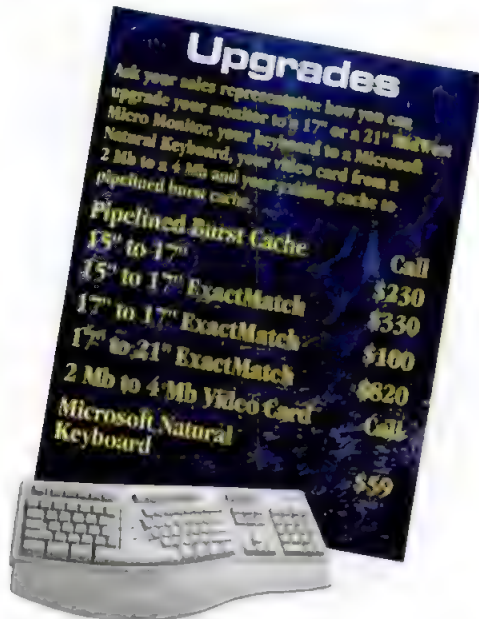
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- 3.5" Disk Drive
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P5-90

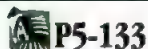
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Source: PC Magazine "Testing the Promise of the Pentium," May 30, 1995



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Portable Double Speed	003728	319

Plextor		
4Plex Quad Speed, internal	006721	\$419
4Plex Quad Speed		
w/SCSI-2 Board, internal	006722	475
6Plex Six Speed, internal	006732	499
6Plex Six Speed w/SCSI-2 Board, internal	006733	519

Sony		
2X Portable Discman	005431	\$395
4X w/Kit, internal	005433	225

FAX MODEMS

Boca		
14.4 V.32bis, external	002047	\$195
14.4 V.32bis, internal	002045	79
14.4 Kbps w/VoiceView, internal	005211	125
28.8 V.34, external	002488	219
28.8 V.34, internal	002484	169
SoundExpression 14.4VSp Voice, internal	002184	169

Intel		
14.4 Kbps, external	004785	\$85
14.4 Kbps, internal	004786	65
14.4 Kbps w/VoiceMail, external	003789	95
14.4 Kbps w/VoiceMail, internal	005566	79
14.4 Kbps w/VoiceMail and		
Speakerphone, internal	005253	119
28.8 Kbps PCMCIA	005993	219
28.8 Kbps w/VoiceMail, internal	005252	159
28.8 Kbps w/VoiceMail and		
Speakerphone, external	005249	189
28.8 Kbps V.34, internal	003785	169
28.8 Kbps V.34, internal	005953	139

Megahertz		
14.4 XJACK PCMCIA	005180	\$199
14.4 XJACK Gold PCMCIA	005181	229
14.4 Fax Modem/PCMCIA Ethernet Adapter	005187	309
28.8 PCMCIA	003706	339
28.8 XJACK PCMCIA	003704	339

U.S. Robotics		
Sportster 14,400 PCMCIA	003888	\$179
Sportster 14,400 V.42bis, external	003887	115
Sportster 14,400 V.42bis, internal	003886	85
Sportster 28,800 V.34, external	003915	209
Sportster 28,800 V.34, internal	003916	189
Sportster 28,800 V.34 PCMCIA	003897	325
Sportster S1 14,400, external	003537	85
Sportster S1 14,400, internal	003536	89

HARD DRIVES

Maxtor		
425 Mb	004840	\$159
540 Mb	004809	169
850 Mb	004825	215
1 Gb	004790	265
1.2 Gb	004826	275
1.6 Gb	005052	429

MONITORS

MAG		
DX15F	004242	\$305
DX17F	004231	659
LI450LB	004226	245
MXP17F	004282	815
MX21F	004288	1065

NEC		
MultiSync XE15	004644	\$535
MultiSync XE17	004645	585
MultiSync XE21	004654	1755
MultiSync XV14	003565	369
MultiSync XV15	004824	429
MultiSync XV17	003566	745

Princeton Graphics		
Ultra 14	006150	\$195
Ultra 14m	006151	239
Ultra 15	006152	305
Ultra 17	006153	349

Samsung		
SyncMaster 3Ne	000354	\$249
SyncMaster 15GL	005274	409
SyncMaster 17GL	005273	695
SyncMaster 17GLs	004589	829
SyncMaster NGLs	005272	895
SyncMaster 20GLs	004524	1325

Sony		
MultiScan 15e1	004742	\$479
MultiScan 17e1	004743	1089
MultiScan 20e1	004744	1995
Trinitron CPD-1425	004847	305

ViewSonic		
V14ES	006590	\$275
V15GA	005737	409
V15GS	005738	419
V17	004132	829
V17GA	005739	835
V17BS	005738	745
V20PS	004905	1289
V21PS	004906	1089

MULTIMEDIA

Altec Lansing		
ACS51 Speakers	006712	\$89
ACS52 Speakers	006713	85
ACS53 Speakers	006714	129
ACS300 1 Speakers	006704	289

Aztech		
Sound Galaxy		
WaveRider 32 Sound Card	004827	\$115

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CREATIVE

Creative Labs		
Sound Blaster 16 Value Edition Sound Card	005600	\$85
Sound Blaster AWE32 Sound Card	005602	279
Sound Blaster AWE32 Value Edition Sound Card	005601	155
Sound Blaster CT-38 Speakers	005613	299
Sound Blaster Digital Schoolhouse Multimedia Kit	005603	225
Sound Blaster Discovery CD 4x Multimedia Kit	005605	345
Sound Blaster Discovery CD New Edition Multimedia Kit	005604	275
Sound Blaster Home 4x Multimedia Kit	005606	415
Sound Blaster SBS300 Speakers	005614	89
Sound Blaster Value CD Multimedia Kit	005620	189

Labtec		
CS-150 Speakers	005100	\$16.75
CS-180 Speakers	005101	21
CS-800 Speakers	005104	34

Media Vision		
MV-2200 Quad-Speed	006964	\$289
Pro Sonic 16 SCSI Sound Card	006956	89

Panasonic		
EAB401P Speakers	001406	\$45
EAB710P Speakers	001407	89

3COM

3Com		
EtherLink III Combo Adapter	006770	\$119
EtherLink III Combo Adapter, 5-pack	006771	525
Fast EtherLink 10/100 BASE-T Adapter	006772	229
Fast EtherLink 10/100 BASE-T Adapter, 5-pack	006773	1115
LinkBuilder FMS 12-Port Hub	006774	839
LinkBuilder FMS 24-Port Hub	006775	1089

Artisoft		
LANtastic Network Starter Kit	007180	\$229
LANtastic v6.0 Software, 1 user	007181	79
LANtastic v6.0 Software, 5 user	007182	329

Boca		
10 BASE-T Concentrator	002182	\$125
BOCALANcard 2000+	005200	69
Combo Adapter		
BOCALANcard 2000+ Combo Adapter, 5-pack	005244	299
BOCALANcard 2000T Adapter	005207	65
BOCALANcard 2000T Adapter, 5-pack	005243	279

Intel		
EtherExpress Pro/10 Adapter, BNC/RJ-45	002167	\$109
EtherExpress Pro/100 PCI Adapter	005164	349
EtherExpress XL Printer Server, BNC	002129	465

Megahertz		
10 BASE-T PCMCIA Adapter	005189	\$149
Ethernet Combo PCMCIA Adapter	005190	179

PRINTERS

Brother		
HL-630	004034	\$399
HL-660	004036	879
HL-960	004046	999
MFC-4500ML	004048	199

Canon		
BJ-30	003918	\$255
BJ-100	002082	175
BJ-200ex	002087	185
BJC-70	003919	349
BJC-4000	003971	349
LBP-430W	003917	429

Epson		
Acclaim Laser 1100	003987	\$399
Acclaim Laser 1400	003971	429
LD-300	002276	185
LD-570+	002099	265
LD-1070+	002105	415
UX-300	001575	179
Stylus Color	001536	529

Lexmark		
2380 Plus Forms	001948	\$325
2380 Plus Forms	002332	345
ExecJet IIS	001893	209
Optima R	006815	1495
Optima R	006809	2825
WinWriter 600	006811	1915

Okidata		
ML184	006099	\$215

OKidata (continued)

ML320	006092	299
ML321	006093	419
ML520	006094	359
ML521	006095	479
ML580	006096	419
ML591	006097	559
OL400e	006099	405
OL410e	006091	535
OL410e/PS	002377	749

Panasonic		
KX-P1150	001672	\$125
KX-P2020	001658	179
KX-P2130	001775	199
KX-P2135	001848	245
KX-P3826	003845	389
KX-P4000	001659	339
KX-P4430	001655	689
KX-P5400	001788	475

Hewlett Packard		
DeskJet 220	004915	\$395
DeskJet 540	004916	219
DeskJet 580C	004938	479
DeskJet L2500C	004937	989

POWER PROTECTION

APC		
Back-UPS 400	001865	\$145
Back-UPS 450	000738	175
Back-UPS 800	001866	239
NET7 SurgeArrest	002191	29
NET7 SurgeArrest w/TEL	002192	45
Smart-UPS 700	006842	349
Smart-UPS v/s 850	006845	295

Tripp Lite		
Isobar 4	001032	\$30
Isobar 4	001165	49
BC Personal 280	005396	87
BC Personal 420	005397	135
BC Personal 500	005398	189
BC Pro 450 Network UPS	005399	149
BC Pro 550 Network UPS	005401	185
TR-6 Super Surge Alert	003783	29

SCANNERS

Canon		
IX-3010	002718	\$289
IX-4015	003069	725

Epson		
ES-1000C	005263	\$725
ES-1200C	003870	969
ES-1200C Pro	003872	1289

SOFTWARE

Microsoft		
Business Applications		
MS Access 2.0, 3.5"	007567	\$289
MS Office 4.2, CD-ROM	007561	625
MS Office Professional 4.2, 3.5"	007552	519
MS Office Professional 4.3 & Bookshelf, CD-ROM	007553	519
MS Office Professional 4.3 & Bookshelf Upgrade, CD-ROM	007597	339.50
MS PowerPoint 4.0, 3.5"	007555	289
MS Project 4.0, 3.5"	007556	499
MS Excel 5.0, 3.5"	007558	279
MS TrueType Font Pack, 3.5"	007564	45
MS Word 6.0, 3.5"	007559	279
MS Word 6.0 & Bookshelf, CD-ROM	007598	269

Microsoft		
MS Arcade 1.0, 3.5"	007574	27.50
MS Flight Simulator 1.1, 3.5"	007598	42
MS Flight Simulator 5.1, CD-ROM	007569	52.50
MS Golf 2.0, 3.5"	007575	42
MS Golf Multimedia 1.0, CD-ROM	007576	42

Microsoft		
MS Works 3.0/Money, 3.5"	007579	83
MS Works 3.0/Money, CD-ROM	007580	83
MS Publisher 2.0, 3.5"	007581	84
MS Publisher 2.0, CD-ROM	007582	84
MS Creative Writer, 3.5"	007583	31.50
MS Fine Artist, 3.5"	007577	31.50

Microsoft		
MS Encarta '95, CD-ROM	007586	84
MS Bookshelf '95, CD-ROM	007585	59
MS Ancient Lands 1.0, CD-ROM	007587	82
MS Art Gallery, CD-ROM	007588	46
MS Automap Road Atlas 4.0, 3.5"	007591	85
MS Automap Road Atlas 4.0, CD-ROM	007592	85
MS Baseball '94, CD-ROM	007578	39
MS Cinemania '95, CD-ROM	007571	52
MS Dangerous Creatures 1.0, CD-ROM	007572	52
MS Dinosaurs, CD-ROM	007573	51

Microsoft (continued)

MS Explorapedia World of People, CD-ROM	007586	29
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Colorado		
HP T1000, internal	004854	\$189
Jumbo 350, external	008037	275
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Jumbo 700, external	008035	139
Jumbo 700, internal	008048	189
PowerTape 1400, internal	008036	189
PowerTape 1100, internal	008020	159
PowerTape 2400, internal	008008	335
PowerTape 4000, internal	008010	1125

Imaging		
Drto 420, external	008704	\$225
Drto 420, internal	008703	115

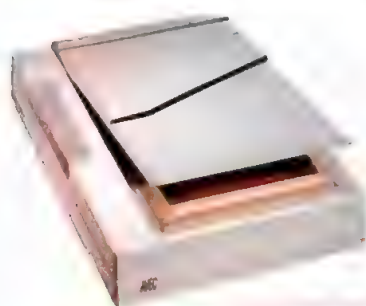
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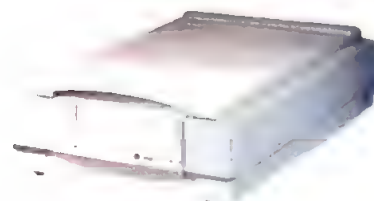
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Relisys 4816T	*799
• Single Pass, 400 x 1600 dpi, w/Photoshop LE	
Relisys 4830T	*1099
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- Scan area up to 8.5" x 14" for up to legal size scans

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Paragon 1200	*549
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MICROTEK ScanMaker IISPX

Better Images Through Innovation.

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Single Pass Color-With Full Photoshop 3.0 and OmniPage Direct OCR!



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- ScanWizard controller software, Adobe Photoshop Plug-in, TWAIN Module
- SM IISPX won PC Magazine's Editor's Choice and Imaging Magazine's Editor's Choice.

ScanMaker IISPX	*469
• Single pass, w/ImageStar II, OmniPage Direct OCR and ScanWizard	
ScanMaker IIHR	*599
• 3-pass, 600 x 1200 dpi, w/Picture Publisher 4.0 & OmniPage Direct OCR	
ScanMaker IIHR	*749
• 3-pass, 600 x 1200 dpi w/Photoshop 3.0 & OmniPage Direct OCR	
ScanMaker III w/Transparency Adaptor	*1995
• Single pass, 36 bit, 600 x 1200 optical dpi, w/Photoshop 3.0	
Transparent Media Adaptor	*499
Auto Document Feeder	*395

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ES-1000C	*749
ES-1200C	*1249
Color Partnership	
CP4000 Scanning System	*14,995
World's most affordable desktop drum scanner! The CP4000 offers sophisticated controls with the simplicity of a Macintosh interface!	
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ScanMaker IISPX	*469
ScanMaker IIHR	*649
ScanMaker IIHR	*599
ScanMaker IIHR w/3.0	*749
ScanMaker III w/TA	*1995
Mustek	
Paragon Office	*599
Paragon 1200	*549
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Plug & Scan	*189
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Nikon	
Super Cool Scan	*CALL
Plustek	
PageReader 800	*199
ScanPlus Color	*275
ScanPlus FX	*449
Relisys	
Avec Office Pro 2400	*449
Reli 4816	*599
Reli 4816T	*799
Reli 4830T w/Photoshop 3.0	*1099
Reli 9624T w/Photoshop 3.0	*1299
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Umax	
Vista S6LE	*CALL
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UC 1260 Pro	*CALL
PowerLook	*CALL

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Mag	
DX17F	*679
Viewsonic	
17" Multimedia	*879
15GA	*CALL

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Calcomp	
DrawingSlate II 6 x 9	*195
DrawingSlate 6 x 9 w/Painter	*439
DrawingSlate II 12 x 12	*235
DrawingSlate II 12 x 18	*299
Wacom	
ArtPad II 4 x 5"	*149
ArtPad II/Dabbler Bundle	*169
ArtZ II Graphic Tablet	*319
ArtZ II 12 x 12	*429

Printers

Epson	
Stylus Color II Printer	*475
Fargo	
PrimeraPro color Printer	*1329
Pictura 310	*3499
Hewlett Packard	
Deskjet 540	*289
Deskjet 560C	*169
Deskjet 1200C	*995
Laserjet 4L	*499
Laserjet 4P	*949
Laserjet 4+	*1429
Laserjet 4M+	*1949
Color Laserjet	*5874

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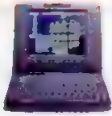
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950N P/75" 8/500MB Dual	3197
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T2110CS 4/75 4/330MB Dual	\$1949
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T2130CS 4/75 8/500MB Dual	2429
T2150CDS 4/75 4/500MB w/CD Dual	2899
T2130CT 4/75 8/500MB Active	2989
T400CS P/75" 8/810MB Dual	4299
T400CDT P/75" 8/810MB w/CD Dual	4389
T610CT P/90" 8/720MB Active	4299

MONITORS



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DX15FE 15" 26mm	ELP
DX15FE 15" 26mm	3374
MX21F 21" 28mm	1699

NEC

MultiSync XV15 15" 28mm	\$419
MultiSync XE15 15" 28mm	524
MultiSync XV17 17" 28mm	724
MultiSync XE21 21" 28mm	1729

CTX

1565D 15" 28mm	\$349
1765GM 17" 27mm	629
1765GME 17" 28mm	689
2085 20" 28mm	1099

ViewSonic

15G 15" 28mm	\$419
15GA 15" 27mm	509
17GA 17" 27mm	824
21PS 21" 25mm	1779

SONY

CPD-15SF 15" 25mm	\$459
CPD-17SF 17" 25mm	849
GDM-20SE 20" 25mm	1899

VIDEO CARDS



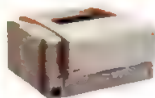
ATI
Graphics XPression
2MB
\$174 ~~\$199~~

Graphics XPression 1MB	ELP
WinTurbo 2MB	132
Graphics Pro Turbo 2MB	255
Graphics Pro Turbo 2MB	298
Graphics Pro Turbo 4MB	419

DIAMOND

Speedstar Pro 1MB	\$95
Speedstar 64 1MB	139
Speedstar 64 2MB	192
Stealth 64 2MB	319
Stealth 64 4MB	464
Stealth Video 2MB	214
Viper Pro 2MB	389
Viper Pro 4MB	534

PRINTERS



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PACKARD**
LaserJet 5P
6ppm 600dpi
\$844 ~~\$879~~

DeskJet 600 Inkjet 600dpi Color	ELP
DeskJet 600 Inkjet 600dpi Color	\$289
DeskJet 600C Inkjet 600dpi Color	399
DeskJet 850C Inkjet 600dpi Color	509
LaserJet 4L 4ppm 300dpi	496
LaserJet SMP 6ppm 600dpi	989
LaserJet 4+ 12ppm 600dpi	1394
LaserJet 4M+ 12ppm 600dpi	1909

EPSON

Stylus Color II Inkjet 720dpi	\$499
Stylus 1000 Inkjet 360dpi	469
ActionLaser 1100 4ppm 300dpi	379
ActionLaser 1400 4ppm 600dpi	479

Canon

BJ-100 Inkjet 360dpi	\$173
BJ-200EX Inkjet 720dpi	199
BJC-600E Inkjet 720dpi Color	469
BJC-4000 Inkjet 360dpi Color	354
LBP-460 4ppm 600dpi	604
LBP-1260 12ppm 600dpi	1279
MultiPass 1000 Multi-function	724

LEXMARK

Optra R 12ppm 1200dpi	\$1419
Optra L 12ppm 1200dpi	1869
Optra LX 16ppm 1200dpi	2399
Winwriter 150C Inkjet 300dpi	359
Winwriter 600 10ppm 600dpi	994

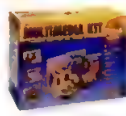
OKIDATA

OL400e 4ppm 300dpi	\$409
OL410e 4ppm 300dpi	529
OL810e 8ppm 600dpi	744
OkuJet 2010 Inkjet 600dpi Color	364

brother

HL-630 6ppm 300dpi	\$399
HL-645 6ppm 300dpi	434
HL-660 6ppm 600dpi	599
HL-660PS 6ppm 600dpi	839
MFC-4000ML Multi-function	879

MULTIMEDIA



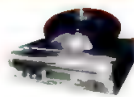
DIAMOND
4000
4X Home
\$279 ~~\$315~~

5000 4X w/Top Games	ELP
6000 4X w/Business Software	\$354
7000 4X w/Top Games	309
	354

CREATIVE

Sound Blaster 32	\$151
Sound Blaster 16 Value Edition	96
Sound Blaster 16-SCS	159
Sound Blaster AWE32	220
Discovery 4X1 Kit	339
Digital Schoolhouse 4X Kit	299

CD-ROMS



NEC
6X1
145ms Access
\$455 ~~\$465~~

6XE PC/Mac Ext.	ELP
	\$545

PLEXTOR

4X w/o Controller	\$306
4X with Controller	356
6X with Controller	500
6X w/o Controller	440

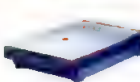
SONY

CSD-760E 4X Int	\$216
PRD-150 2X Discman	365
Spresra CD-Recordable	1750

TOSHIBA

XM3601B Quad Speed Int	\$315
XM3601 Quad Speed Ext	409

SCANNERS



**HEWLETT
PACKARD**
ScanJet 3C
600dpi Color
\$899 ~~\$949~~

ScanJet 3P 300dpi Grayscale	ELP
	\$307

Canon

IX-3010 300dpi Grayscale	\$298
IX-4015 400dpi Color	699

MICROTEK

ScanMaker IIG 300dpi Grayscale	\$215
ScanMaker IIS 300x600dpi Color	444
ScanMaker IIR 600dpi Color	529
ScanMaker III 300x600dpi Color	354
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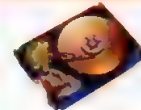
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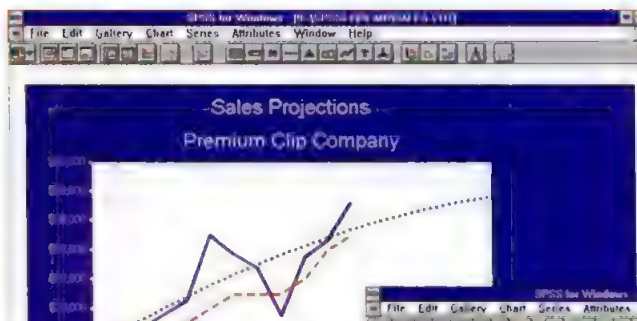
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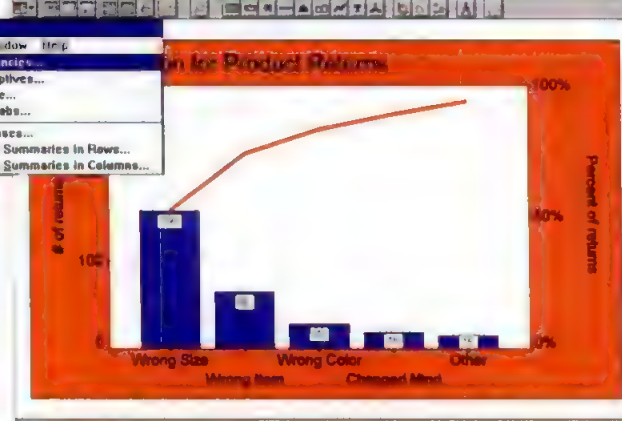
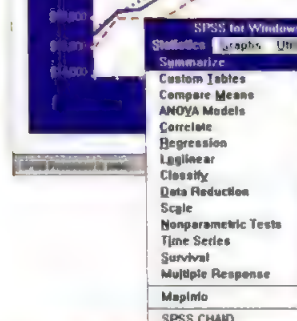
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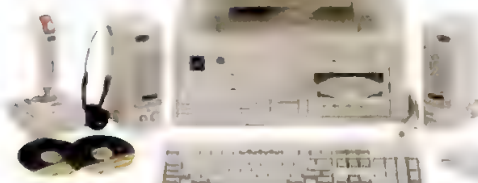


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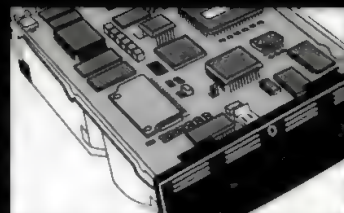
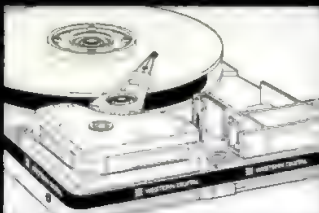
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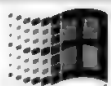
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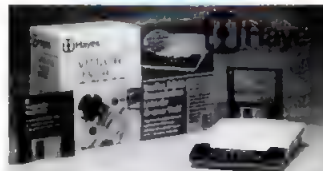
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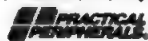
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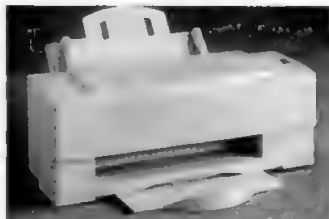
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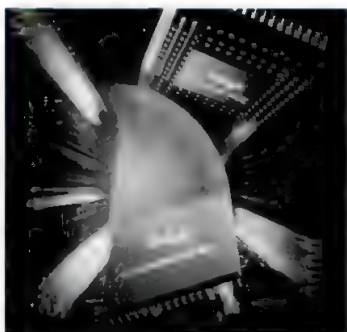
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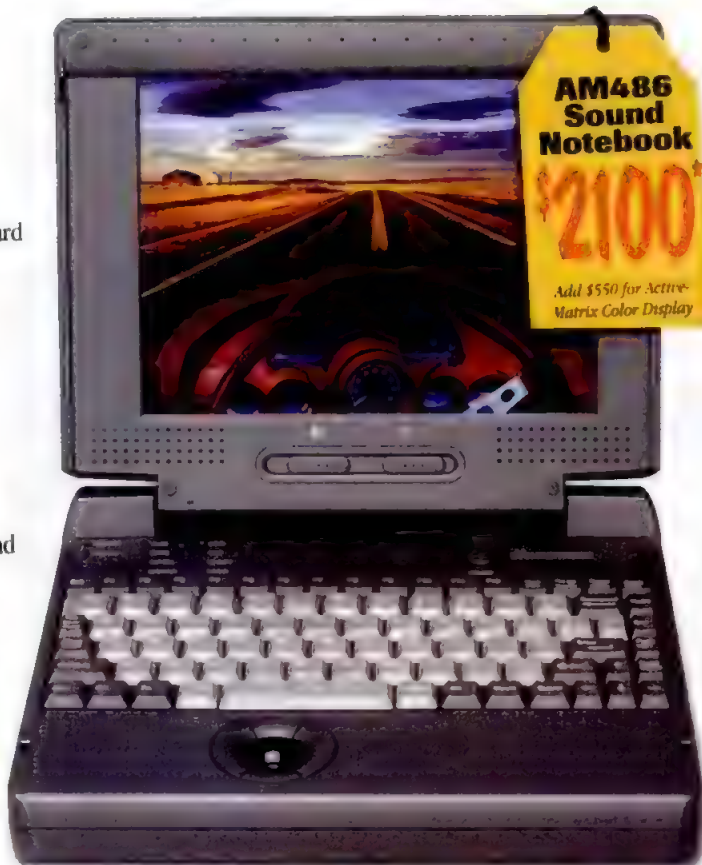
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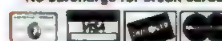
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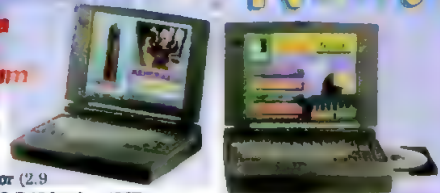
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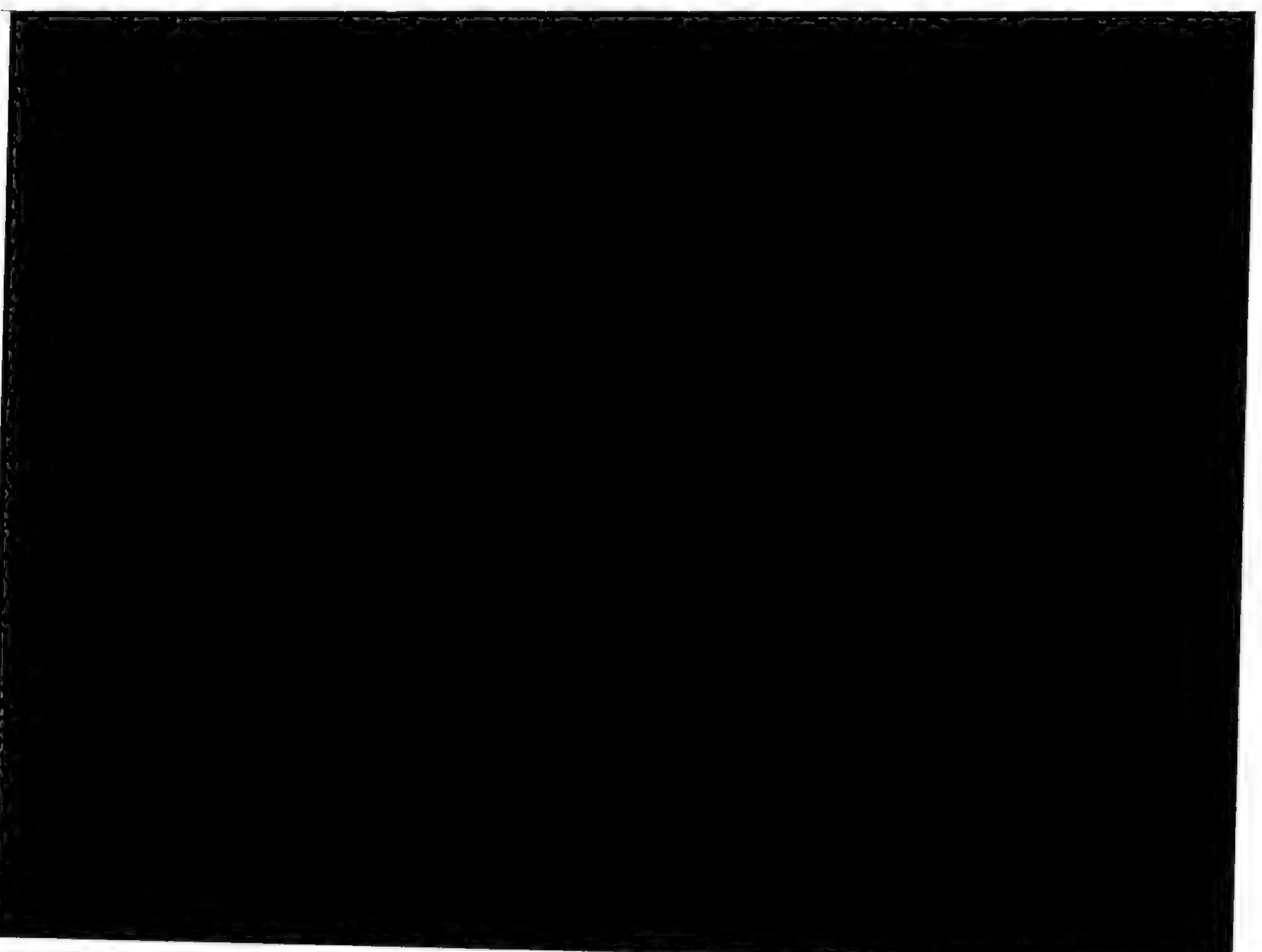
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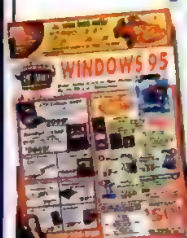




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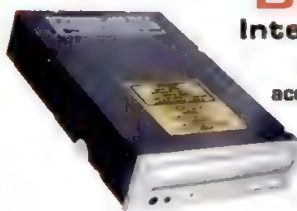
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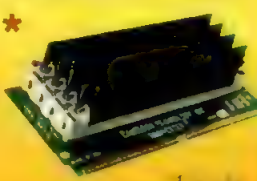
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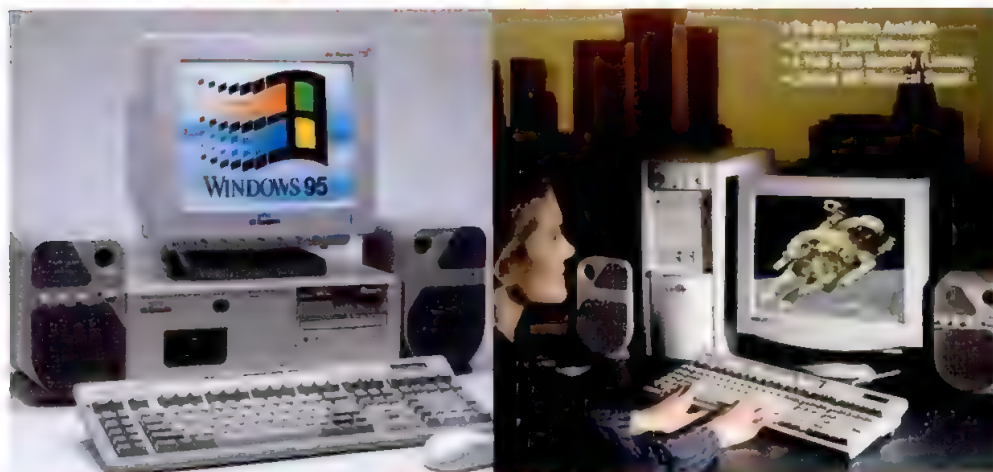
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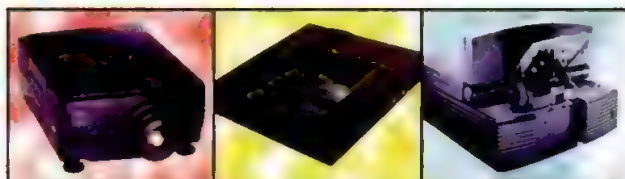
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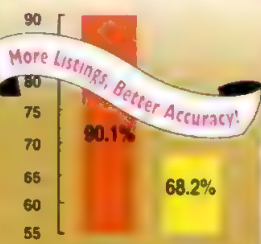
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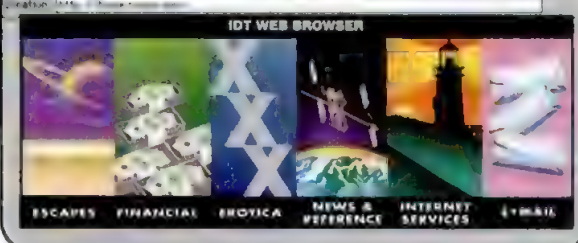
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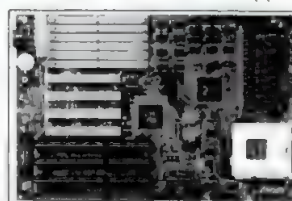
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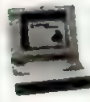
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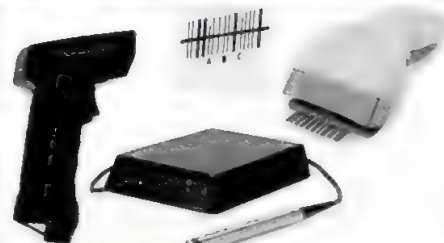
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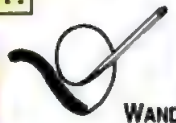
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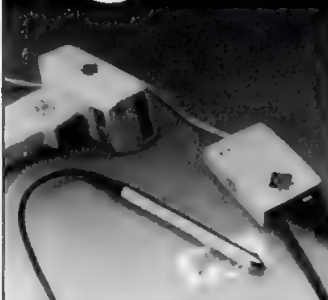
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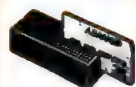
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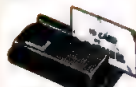
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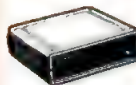
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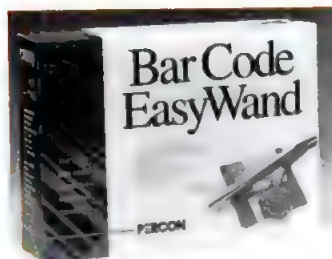
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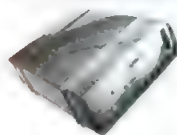
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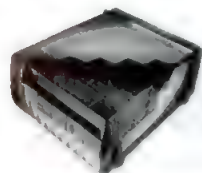


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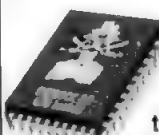
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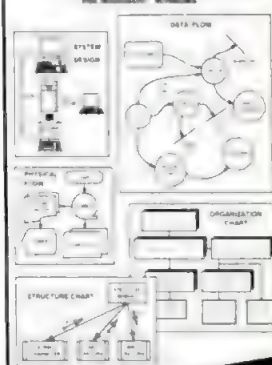
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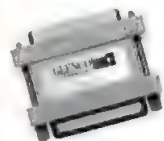
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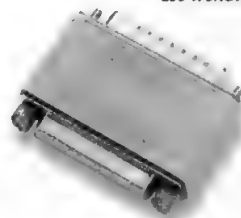
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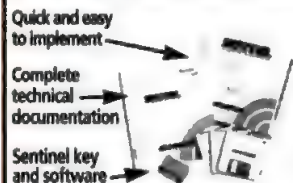
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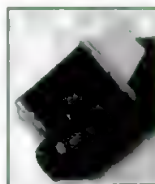
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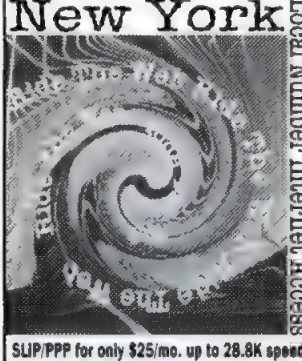


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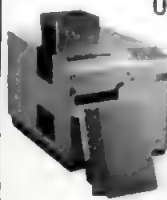
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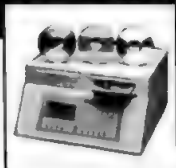
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At Home

A SPECIAL REPORT ON PRODUCTS FOR THE PERSONAL SIDE OF COMPUTING



Hooking Up with Home Modems

The Net. The Web. Cyberspace. Call it what you will, but unless your PC is equipped with a modem, you'll never know what you're missing. Whether you want to chat on America Online, download a shareware utility from CompuServe, or get junior homework help on Prodigy, you'll need a modem.

Most desktop computers sold today, especially those packaged as family computers or small-office/home-office systems, come equipped with an internal modem. Chances are good, though, that unless you bought your PC within the past six months, that modem is rated at 9,600 bits per second (bps) or slower, and the process of getting on-line and

accessing the graphics, animations, and sounds that lured you to the Net in the first place will be a hurry-up-and-wait ordeal.

Modems rated at 14,400 bps (or 14.4 Kbps) are the minimum you need for anything near comfortable on-line sessions; otherwise the time you have to wait for the graphical-interface screens to load drags on and on. If you already have a 14.4-Kbps modem, you might be able to hold off for a while before upgrading. If you're still dialing with a 9,600-bps modem, or even worse, a 4,800-bps modem, start shopping now for a 28,800-bps modem. You'll be amazed at how quickly all your on-line interactions proceed with one of these

By Bruce Brown

communications marvels.

The argument against buying anything faster than a 14.4-Kbps modem has traditionally been one of on-line usability and price. Until recently, the major on-line services just didn't offer 28.8-Kbps support. By the time you read this, though, CompuServe will offer 28.8-Kbps dialup for a long list of cities, and America Online and Prodigy will also be firmly onboard the high-speed bandwagon.

The price issue, too, is rapidly fading. An external 14.4-Kbps modem may cost about \$100 less than the \$150 to \$220 you'll have to pay for a 28.8-Kbps model of comparable quality, but you'll want to replace the slower model within six months; with a 28.8-Kbps modem you should be set for some time to come.

If you're going to use a 28.8-Kbps modem with an older 486- or 386-based PC, you may need to replace your existing serial port with one equipped with a 16550 UART. An older UART lacks the extended buffers necessary for seamless, speedy transmittal of compressed data.

Once you've decided 28.8 Kbps is the way to go, your next decision will be to choose between internal and external models. There are good arguments for both, but for home users external modems are the better choice. Internal modems

Cardinal 28.8 External Fax Modem Motorola Power 28.8 Data/Fax Modem

These two Editors' Choice picks should meet the needs of the full spectrum of home users, from Net novices to on-line old-timers.

The Cardinal 28.8 External Fax Modem won't blow you away with its technical performance—in fact, it finished near the bottom of the pack on two of our technical tests—but a strong consumer focus and a street price of \$179 make it a good choice for those who can live without blazing speed. This tidy little modem provides novices with an illustrated manual for quick-and-easy setup, a good selection of on-line service start-up kits, extended technical-support hours, and an unbeatable lifetime warranty—all at a price that won't break the bank. The Cardinal 28.8 also proved to be a stellar on-line connector: It was one of only two modems that was able to make all our on-line connections when inadvertently hooked up to the PC via a faulty cable. The modem also supports flash ROM, so you'll be able to download firmware upgrades as they come down the pike.

Those who need less hand-holding and more speed and advanced features will want to take a long look at Motorola's Power 28.8 Data/Fax Modem. This modern-looking modem finished second on both our Through-

put vs. File Type and Telephone-Network Simulation tests, and it earned an average Fax score. Besides being able to transmit data speedily over even impaired telephone lines, it can easily connect to the full range of on-line services. Its software bundle is adequate, and its five-year warranty is about average for the category. What really sets this modem apart, though, is its array of high-end features. In addition to support for flash ROM, the Motorola Power 28.8 offers remote diagnostic capabilities, Caller ID, distinctive ring, and password access and automatic callback for the security minded. With a street price of \$249, the Power 28.8 is one of the most expensive modems we reviewed, though.

Honorable mentions go to the Best Data Products' SmartOne 2834FX for its category-leading software bundle, which includes start-up kits for the three major on-line services as well as Delrina 4-in-1; and to U.S. Robotics' Sportster 28.8 V.34 Faxmodem for its consistently impressive performance and equally impressive software bundle.



save desk space and cut down by two the number of cables attached to your computer system (external models require a serial cable and a power cable for their essential AC adapter, while internal models require

neither), but there are good reasons to spend the extra \$20 or \$30 to buy an external modem. With an external modem, you just plug in a serial cable from the modem to the back of your computer; there's no need to open the computer and playing the IRQ-conflict game, and no need to tie up one of your scarce expansion slots. External modems also have indicator lights that can tell you a lot about the status and activity of your current telecommunications connections.

WHAT WE REVIEWED

To make it into this roundup, modems had to work on stan-

dard telephone lines at speeds of up to 28,800 bps, support the V.34 communications standard as well as other major compression and error-correction standards, and support up to 14,400-bps fax transmission. The modems also had to be intended specifically for home users and carry an estimated street price of under \$250.

The competition in this market is intense, with more vendors producing modems that meet these criteria than we could include here. To narrow the field, we chose the top modem vendors by sales volume; this final list included AT&T/Paradyne, Best Data

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REPORT CARDS

Reading the Report Card

Products, Cardinal Technologies, Hayes Microcomputer Products, Motorola Information Systems Group, Multi-Tech Systems, Practical Peripherals, Supra Corp., U.S. Robotics, and Zoom Telephonics. Boca Research is also a top seller and would have been included, but Boca did not get samples to us in time for testing.

The modems reviewed in this article don't have all of the state-of-the-art features, such as simultaneous voice and data on the same line (SVD), but chances are you won't use those features enough to justify the \$100 or so they add to the cost of a modem. If you're interested in learning more about these technologies, don't miss the sidebar "Talking Transfers."

WHAT WE LEARNED

You might assume, as we did, that a batch of modems with the same technical parameters, based on a mature technology, would be pretty much alike, and that once they were set up you'd never care which one you had. Indeed, generally these modems performed alike, but some harder-to-quantify elements made the difference.

We looked carefully at the design, documentation, and setup aids of each modem, in each case evaluating how well suited they are to the needs of the home user. Modem manuals have never been gripping reading, and the ten we read for this roundup are no exceptions. What we did find, though, were some helpfully illustrated quick-start cards that

Transfer speed tells only a very small part of the story when it comes to home modems. The features discussed below will probably contribute more to the success of a modem than sheer speed alone. We graded each of the modems in six categories important to home users. The grades we used and their meanings are as follows: A, significantly above average; B, above average; C, average; D, below average; E, failing.

In assessing **setup**, we considered both how easy it is to configure the modem for use, and how easy it is to get the modem to connect with your favorite on-line services. To earn an excellent grade here, a modem had to provide an easy-to-understand setup guide, install effortlessly, and connect with our suite of on-line services on the first try.

Design takes into account the physical design of the modem. Important factors here include the placement and durability of the modem's switches and buttons, the placement and readability of its status indicators, and the overall size and sturdiness of the modem.

In the **software** category, we assessed the quality and depth of a modem's software offerings. To earn

high marks here, a modem had to provide startup kits for the major on-line services (America Online, CompuServe, Prodigy), as well as better-than-average communications and fax software. Including a net browser, special function software, or start-up kits for additional on-line services earned a modem a higher grade.

Performance is where we focus on the speed and reliability of the modem. We considered Benchmark performance on the Fax, Telephone-Network Simulation, and Throughput vs. File Type tests.

To determine a grade for **service and reliability**, we considered the modem's warranty and the vendor's technical support policy. To earn a grade of A, a vendor had to offer multiple ways of reaching technical support, at least one of which was a toll-free call, and extended technical support hours.

Overall value encompasses all of the above, weighed against the price of the modem. To earn high marks here, a modem must be easy to configure to run with your PC; connect easily with a variety of on-line services; be solidly and thoughtfully designed; offer all the software you need to get up and running in a hurry; be able to maintain a solid connection, no matter what the line conditions might be; offer service and support when you need it, where you need it; and do it all at a price that won't make you flinch.

show you what cable to stick in where and what button to push or slide to turn on the power.

Convenience counts, so we checked out the communications and on-line service software included with the modems. After all, what's the point of unpacking your new modem if you don't have instant access to the on-line service of your choice? Following the same line of thought, we gave extra points to the few modems that included the vital serial cable needed to hook up an external modem to your computer. Only three of the ten modems—the Hayes Accura 288 V.34/V.FC + Fax,

the SupraFAXModem 288, and the U.S. Robotics Sportster 28.8 V.34 Faxmodem—included this cable. Finally, we looked at the length of the modem's warranty, whether calls to technical support are toll-free, and what hours technical support is available.

To make sure the modems work the way they should, we put them through a series of performance tests as well as on-line connections tests. At PC Magazine Labs we hooked the modems to identical 90-MHz Hewlett-Packard Pentium test machines, one with Microsoft Windows 3.1 installed, the other configured with Microsoft Windows 95. On both platforms, we connected with America Online, CompuServe, Prodigy, Lotus Notes, and the Internet, using Netcom's Netscape Web

browser. With the Windows 95 system we also dialed in to the new Microsoft Network. At ZD Labs we subjected the modems to a series of arduous performance tests, timing fax performance and measuring data throughput and connection reliability.

If you just want to hook up and dial in, any of these modems should do just fine. Our initial assumption that modems that follow the same specification are generally the same proved to be true, with an accent on *generally*. The modems differ in design, setup aids, included software, essential hardware performance, and service and support policies. While any of these 28.8-Kbps modems will probably do the trick, you'll want to choose carefully in order to make the right connection.

Our Contributors: BRUCE BROWN is a contributing editor of *PC Magazine*. JIM WOLF is a project leader at ZD Labs. DAVID A. HARVEY is a freelance writer. GAYLE C. EHRENMAN was the associate editor in charge of this story, and BILL FLANAGAN was the project leader.

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AT&T DataPort Express 28.8

When you think about telephone service, you probably think of AT&T. So it should come as no surprise that the company has its hand in the modem business. Its entry into the home-modem market is the AT&T DataPort Express 28.8, with an estimated street price of \$179. A good though unexceptional buy, the DataPort Express offers solid performance at a reasonable price. The biggest drawback to this modem is that it has a less-than-complete selection of on-line service start-up kits.

The modem does not include a serial cable, but its ports are labeled and the quick-start guide (which includes a toll-free number for assistance) makes installation a snap.

The midsize DataPort Express has an attractive light-gray case, a power switch on the back, and nine status-indicator lights on the front. There are no modem-speed indicators and no alphanumeric displays on the front of the modem, though, so you can only guess at what speed you're connected. Inside, you'll find a Rockwell signal converter and a Silicon Systems controller chip.

For those looking to get on-line in a hurry, the DataPort Express may be something of a disappointment. The modem includes Quick-Link II for Windows and DOS to handle the faxing and general communications chores and start-up kits for only two on-line services: America On-

line and The ImagiNation Network, AT&T's game and entertainment service. Coupons for other on-line services and FarSite PC whiteboard document-sharing and conferencing software are included as well.

Like most of the modems in this roundup, the DataPort Express connected successfully with all the on-line services. In our labs-based performance testing, the DataPort Express had the second-fastest Fax score and average scores on the Telephone-Network Simulation and Throughput vs. File Type tests.

REPORT CARD

AT&T DataPort Express 28.8

Setup	A
Design	B
Software	D
Performance	B
Service and reliability	B
Overall value	B



The AT&T DataPort Express offers decent performance at a low price.

If you run into operating problems with the AT&T DataPort Express, you'll appreciate its five-year warranty and toll-free technical support from 8:00 A.M. to 8:00 P.M. (eastern time) weekdays, and 10:00 A.M. to 6:00 P.M. Saturday.

If you already have all the on-line software you need and are more concerned with reli-

ability than flat-out speed, the DataPort Express might be a good choice. It offers a low price, decent performance, and a name you know.

AT&T DataPort Express 28.8. List price: \$239. AT&T/Paradyne, North Largo, FL; 800-482-3333, 813-530-2000; fax, 813-530-2103.

Circle 441 on reader service card

Best Data Products Inc.

SmartOne 2834FX

The SmartOne 2834FX is about as middle-of-the-road as you can get when it comes to modems. Its estimated street price of \$199 is midrange for the modems we looked at for this survey. The

Talking Transfers

Faster than a speeding file transfer, more powerful than multiple telephone lines, simultaneous voice and data (SVD) is the hottest thing to hit modems since telephony went public. Simply put, SVD gives your modem an ability it should have had in the first place: a way to let you talk and transfer data simultaneously over a single connection.

Imagine that you're toasting demons in DOOM over a modem connection, all the while trading gossip about your university roommates. You're in San Francisco and your partner is in New York; you've both got the same document on your screens, collaboratively editing it and discussing changes. On the phone with a potential employer, you discover that they'd like to see your resume; you send it without ever hanging up. This is what SVD delivers.

As was the case with early 28.8-Kbps modems, vendors are pushing their own versions of SVD. There are a slew of options from vendors such as AT&T, DSP Development Corp., and Multi-Tech Systems. Beware these beta standards. Once a standard is finalized, these early modems probably won't be compatible with the new standard or with each other. If you remember the rapid evolution from V.32terbo to V.FAST

to V.FC that the 28.8-Kbps modem market endured before the V.34 standard was finalized, you'll proceed with caution.

BIRTH OF DSVD STANDARD

Fortunately, a consensus seems to have been reached. A strong consortium, backed by Intel, has advanced its digital simultaneous voice and data (DSVD) solution; the number of heavyweights who have thrown their hats into the DSVD ring is impressive, and it looks as if DSVD will win out.

At press time, DSVD modems were just beginning to land on the shelves. None are based on a standard; none are guaranteed to be compatible with anything but modems from the same manufacturer. If, as you read this in October, a standard has been reached, you won't have to worry about which brand you buy; if not, be certain that the people you wish to exchange DSVD connections with have compatible hardware.

At the time of this roundup, though, only one DSVD prototype exists: the \$389 Access Sportster Vi 28.8 from U.S. Robotics (800-342-5877). Configured with flash ROM, the Sportster will upgrade easily to future DSVD standards. For now, however, if you want to use its DSVD capabilities, you'll need an

28.8 External Modems

SmartOne's overall value is about average as well. It offers a better-than-usual software complement offset by a shorter-than-typical warranty period.

The SmartOne doesn't come with a serial cable, but its ports are labeled, the manual has handy illustrations, and the quick-installation sheet will help you get up and running. If you need help during setup it'll cost you, since there's no toll-free technical support.

This modem has a slightly bulbous look and is larger than most of the modems we reviewed. It is based on a

Rockwell chip set and Rockwell converter and has remote diagnostics capability. There are eight status lights on front of the modem, but no LED display or speed indicators. The power switch is located on the back.

A great selection of bundled software is included with the SmartOne, including Delrina's 4-in-1 pack of WinFax Lite, DOSFax Lite, and COMit for DOS and for Windows. On-line service starter kits are

included for the big three: America Online, CompuServe, and Prodigy.

We had no problems mak-



The SmartOne 2834FX offers a great software bundle.

ing connections with all the on-line services on either the Windows 3.1 or Windows 95 machines. Results were mixed in technical testing, however, with the SmartOne turning in better-than-average performance on the Fax and Telephone-Network Simulation tests, but the second-worst performance on the Through-

put vs. File Type test. So while the modem may work over a variety of telephone-line conditions, it won't necessarily download in a hurry.

Service and support policies are substandard. Getting technical help with your modem means making a toll call between the hours of 11:00 A.M. and 7:30 P.M. (eastern time) Monday to Friday; no support is available on weekends. The modem offers only a two-year warranty, which is shorter than that offered by most of the modems in this roundup.

For these reasons, it's tough to recommend the SmartOne 2834FX for home users. The combination of subpar service policies and lackluster performance makes the SmartOne 2834FX a not-so-smart choice.

SmartOne 2834FX. List price: \$299. Best Data Products Inc., Chatsworth, CA; 800-632-2378, 818-773-9600; fax, 818-773-9619.

Circle 442 on reader service card

identical modem at the other end. Meanwhile, companies such as AT&T, Hayes, and Multi-Tech Systems have promised to put DSVD modems on the market soon.

THE VOICEVIEW ALTERNATIVE

There's even a lower-end contender, analog simultaneous voice and data (ASVD), which isn't truly simultaneous but rather

SVD (simultaneous voice and data) gives your modem a way to talk and transfer data at the same time over a single connection.

quickly switches between voice and data. VoiceView, Radish Communication System's ASVD technology, is included in Microsoft Windows 95.

Access VoiceView from within Windows 95 (or use Radish's TalkShop software) with a compliant modem and you get something resembling simultaneous voice and data transmission. Transfers are slow and voice is choppy, but it does work. And with numer-

ous modem makers adopting this new technology, chances are pretty good that you'll find people with whom to simulcast.

One shining example of ASVD in action is the Multimedia Voice Modem With VoiceView, from Boca Research (407-997-7202). Priced at an affordable \$260, this modem has it all: 28.8-Kbps data transfer, 14.4-Kbps fax capabilities, speakerphone, voice-mail, and VoiceView. Other vendors offering similar bundles include Cardinal Technologies, Creative Labs, Diamond Multimedia Systems, and U.S. Robotics.

VoiceView has another feather in its cap: Radish's MarketPlace, which is designed around VoiceView and TalkShop as a secure cyber mall. 1-800-Flowers is there already, and more vendors are coming soon. Technical support is another projected use for VoiceView: A technician could demonstrate a string of commands rather than simply dictating them over a phone line.

Keep your eyes on the standards game. DSVD will be standardized soon. As for ASVD, it adds so little to a modem's price tag that there's no reason not to give it a whirl; chances are that most shipping modems will have it by the time you read this.—David A. Harvey

Cardinal Technologies Inc.

Cardinal 28.8 External Fax Modem



With its low estimated street price of \$179, a generous lifetime warranty, and good reliability in making on-line connections, the Cardinal 28.8 External Fax Modem is one of the best values around—and our Editors' Choice for novice users.

The Cardinal Fax Modem is likely to catch your eye at the local computer mart, thanks to the big red bird on its consumer-conscious box. Inside the package you'll find a compact 1.5- by 5- by 5.3-inch modem that uses a Rockwell chip set and signal converter,

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Aspire Desktops

Processor Choices

- 486DX4/100
- Intel Pentium processor

System Memory

- 8MB system memory; expandable to 128MB*

Expansion

- Two PCI slots*
- Two ISA slots (three on DX4/100 models)
- One shared by PCI and ISA*

Modem

- 14.4kbps fax modem

Mass Storage

- 540MB to 1GB hard drives

Aspire Minitowers

Processor

- Intel Pentium processor

System Memory

- 8MB system memory; expandable to 128MB

Cache

- 256KB second-level cache

Expansion

- Three PCI slots
- Four ISA slots
- One shared by PCI and ISA

Devices/Bays

- Three additional expansion bays

Modem

- 28.8kbps fax modem

Mass Storage

- 1GB to 1.6GB hard drives

All Aspire systems include:

Graphics

- Accelerated graphics with 1MB video memory, expandable to 2MB
- Full-motion video acceleration hardware supports software MPEG video playback

Multimedia Features

- Sound Blaster™-compatible 16-bit stereo sound card
- Up to 44.1kHz sampling rate
- Five-channel stereo mixer
- Joystick/MIDI port
- Quad-speed CD-ROM on most models

Modem

- Two modem telephone jacks
- Fax modem with telephone answering machine/voice mail
- Full-duplex speakerphone

Devices/Bays

- One 3.5" hard disk drive
- One 3.5" 1.44MB diskette drive
- CD-ROM drive in 5.25" bay

Warranty

- Three-year limited warranty; first-year on-site service; second and third years Carry-in or Mail-in

Software

- 50 preloaded software and reference titles (a \$1700** value)



Aspire Monitors

Screen Sizes

- 14", 15", and 17" color monitors with viewable images of 13.1", 13.6" and 15.7" respectively

Dot Pitch

- .28mm

Resolution Support

- 14" Aspire 33s: 800 x 600 and 640 x 480 and all VGA modes
- 15" Aspire 56s: 1024 x 768 at 75Hz, 800 x 600 at 72Hz, 640 x 480 and all VGA modes
- 17" Aspire 76is: 1280 x 1024 at 60Hz, 1024 x 768 at 75Hz

Front-Panel Controls

- 14" features analog controls
- 15" and 17" feature digital controls

On-Screen Functions

- 17" monitor features on-screen controls

Audio

- Up to six watts/channel, stereo speakers
- Unidirectional microphone

Warranty

- Same as Aspire systems; If standalone, only One-year Carry-in or Mail-in

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28.8 External Modems

and comes configured with flash ROM, so you can easily upgrade the modem by downloading new firmware when the next speed standard comes



The Cardinal 28.8 External Fax Modem offers good overall value.

along. There are eight status lights on the front of the modem and a power switch on the back, but the modem does not offer alphanumeric LEDs or speed indicators and does not include a serial cable. The modem's ports are labeled, and the documentation has illustrations to help you during setup. The toll number for tech support is in the back of the somewhat sparse manual.

There's an average collection of bundled software that includes COMit for Windows and DOS, FaxWorks, and start-up kits for both America Online and CompuServe.

The Cardinal Fax Modem performed exceptionally well on our on-line connection test; it was one of only two modems (the other was the Practical Peripherals) able to connect with all the on-line services under Windows 3.1 and Windows 95 even when we inadvertently used what proved to be a faulty serial modem cable. We don't recommend products based on their ability to work with others' defective components, but it speaks well for the Cardinal Fax Modem that it was able to make and keep a connection even with

unfavorable conditions.

The Cardinal Fax Modem was less outstanding on our performance tests. It turned in an average time on our Fax tests, the lowest average throughput on our Telephone-Network Simulation test, and a well-below-average Throughput vs. File Type test score. This modem isn't a stellar performer, technically, so if speed is one of your primary concerns, you might want to look elsewhere.

The modem does offer excellent support policies, though. You can't ask for any longer than Cardinal's lifetime warranty. Having a toll-free number for support would be nice, but the company does have extended weekday service hours.

If you're looking for value, the Cardinal 28.8 External Fax Modem should be at the top of the list. It may not offer the speediest performance, but it can handle any on-line connection you throw at it, at a price your wallet won't mind.

Cardinal 28.8 External Fax Modem. *Estimated street price: \$179. Cardinal Technologies Inc., Lancaster, PA; 800-775-0899, 717-293-3124; fax, 717-399-2324.*

Circle 443 on reader service card

Hayes Microcomputer Products Inc.

Accura 288 V.34/V.FC + Fax

Hayes Microcomputer Products has long been the biggest name in computer modems, literally the standard setter. Other companies are sure to promote their products' Hayes AT command set compatibility as a measure of

worth. So we found it surprising, given the company's premier role, that one of their own modems proved to be just an average performer on our tests. And at an estimated street price of \$220, it's one of the higher-priced external home modems we covered in this roundup.

This is one piece of equipment to beware if your desk space is at a premium: At 1.4 by 5.8 by 9.6 inches, the Accura is the largest modem we looked at. It's actually big enough to sit a phone on. It has a power switch and labeled ports on the rear and eight status indicator lights in front, but no speed indicators or alphanumeric LEDs. The modem is based on a Rockwell signal converter and a Motorola controller chip. In a big plus, the Accura comes with a serial cable with a 9-pin plug on one end and a 25-pin plug on the other end, plus a 9-pin-to-25-pin adapter for the computer end of the cable. The Accura is one of the three modems (along with the SupraFAX-Modem 288 and the U.S. Robotics Sportster) in this roundup to include a serial cable, necessary for connecting the modem to the PC; and one of only two modems (the other is the Supra) to supply the adapter, which you may need to hook up the modem to an older PC.

Also included are an illustrated manual, a handy quick-start sheet, and an AT-command reference sheet for more experienced or more adventurous users, all of which should make getting set up a little bit easier.

Once you have the modem set up, take a look at the gen-

erous software bundle, which includes start-up kits for America Online and CompuServe, Hayes Smartcom for

Windows LE communications software, and Hayes Smartcom Fax for Windows for fax transmission.

You'll want to become familiar with this fax software; during the course of testing, we discovered an incompatibility between Delrina's WinFax PRO (our test software) and the Accura modem that prevented the modem from successfully completing our Fax tests. Note that the Accura was able to complete all fax operations using the included Smartcom Fax for Windows software. A

REPORT CARD

Accura 288 V.34/V.FC + Fax

Setup	A
Design	B
Software	B
Performance	C
Service and reliability	C
Overall value	B



The Accura 288 V.34/V.FC + Fax offers an excellent start-up guide.

new version of the Accura, with a different design and updated firmware, fixes the problem and will be available by the time this is printed. Hayes is also working with Delrina to fix the problem on the model we tested.

The Accura's performance on our other tests ranged from slightly below par to first-rate. It turned in the highest score on our Throughput vs. File Type test, making it a good choice for serious file transferring. It didn't fare as well on the Telephone-Network Simulation test, where it placed seventh overall. On-line connection testing yielded perfect

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in text and graphics performance. Which is why they're setting sales records at savvy computer stores. Another reason is Nanao's Windows 95 Plug & Play* compatibility. Complicated user set-up adjustments at the time of installation are virtually eliminated. And switching resolutions on-the-fly is a snap. Users are also drawn by Nanao's reputation for outstanding long-term reliability plus the stunning array of new advanced technical features that are ideally suited for graphical environments. Nanao even offers a choice of four 17" models to satisfy your budget,

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application requirements and tube preference. The F2-17EX features an ultra fine dot pitch Invar shadow mask flat-square tube, while the T2-17TS features the new hybrid technology aperture grill tube. Both monitors provide the power you need to achieve true-to-life colors, crisp typography and a stable screen image. Flicker-free resolutions up to 1280 x 1024 @ 82Hz refresh rate, Colorific™ screen/printer color matching software and on-screen image controls deliver previously unheard of levels of performance. For added safety against emissions, TCO compliance is now available as a standard feature.

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F2-17EX

Dot Pitch	0.26mm
Actual Viewing Diag.	16.1"
Scan Freq.	H:30-96kHz, V:55-160Hz
Res. Resol.	1280 x 1024 @ up to 82Hz
Max Resol.	1600 x 1200 @ up to 66Hz
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Standards	MPR-II, TCO, FCC B

T2-17TS

Grill Pitch	0.25mm
Actual Viewing Diag.	16.0"
Scan Freq.	H:30-96kHz, V:55-160Hz
Res. Resol.	1280 x 1024 @ up to 82Hz
Max Resol.	1600 x 1200 @ up to 66Hz
On Screen Control	ScreenManager™ and ScreenManager™ Pro
Standards	MPR-II, TCO, FCC B



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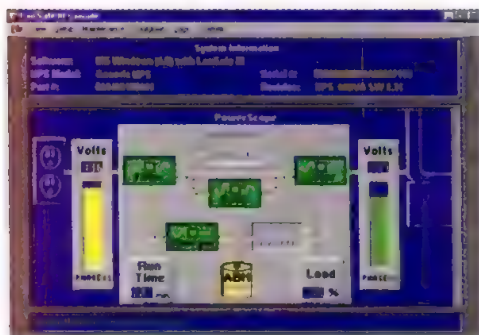
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results under both Windows 3.1 and Windows 95.

The modem comes with a scanty two-year warranty, but Hayes will automatically extend this standard coverage to five years if you register the product within 90 days of purchase. Technical support is available via a toll-free number, which you can find in the Summary of Features. Be sure to write it down; the documentation only lists a toll number.

Overall the Hayes Accura V.34/V.FC + Fax modem is a decent performer, with good file-transfer capabilities and great setup help. Unfortunately the modem's inability to work with the fairly standard Delrina fax software remains a barrier to a clear recommendation.

Accura 288 V.34/V.FC + Fax.
List price: \$299. Hayes Microcomputer Products Inc., Atlanta, GA; 800-723-8388, 404-441-1617; fax, 404-449-0087. Circle 444 on reader service card

Motorola Information Systems Group

Power 28.8 Data/Fax Modem



The Power 28.8 Data/Fax Modem is strong on technical features, support, and performance, making it one of the best deals in this survey—and our Editors' Choice for serious users. The one drawback is its \$249 estimated street price, which makes it one of the priciest modems in this roundup.

The Power 28.8 gets top grades for setup. Its ports are labeled, its manual has helpful illustrations, and the toll-

free tech-support number is printed both on the box and on the front cover of the manual.

Besides being easy to set up, the modem has a curved, compact, modern design. Its power switch is on the back, along with a small reset button. There are eight status lights on the front but no speed indicator or alphanumeric displays. The modem uses a Thompson signal converter and the company's own Motorola controller chip with flash ROM, for easy upgrades when new speed standards come along.



The Power 28.8 offers a full complement of sophisticated features.

The Power 28.8 offers a few unique features, including remote diagnostic capabilities, distinctive ring (a phone-company option that allows more than one phone number to be used over a single phone line), and support for Caller ID hardware. The modem also has integrated security features including password access and an automatic callback mode. When the modem receives a call in callback mode, it automatically hangs up and dials a previously stored number, preventing anyone from accessing your computer unless they're calling from the stored number.

The software bundled with the Power 28.8 includes start-up kits for America Online and CompuServe, and Quick-

Link II for general communications and faxing.

The Power 28.8 made all of our on-line connections with ease under both Windows 3.1 and Windows 95. Technical performance test scores also were very good. The Power 28.8 posted an average Fax score and placed second on both the Telephone-Network Simulation and Throughput vs. File Type tests.

A five-year warranty (average for the modems in this roundup) and toll-free technical support with extended weekday hours make Motorola above average, though not a leader in its service and support policies. The company does get high marks for printing the toll-free number visibly. BBS and fax-back support numbers are also printed on the modem box cover.

It's priced a little high and the selection of bundled software is just a little bit lacking (add a Prodigy start-up kit and we'd be happy), but the Power 28.8's performance, design, and technical features make it a strong candidate for your consideration.

Power 28.8 Data/Fax Modem.
List price: \$349. Motorola Information Systems Group, Huntsville, AL; 800-365-6456, 205-726-0798; fax, 508-337-8004.

Circle 445 on reader service card

Multi-Tech Systems Inc.

MultiModem MT2834ZDX

Multi-Tech Systems specializes in higher-end modems, including patented hardware that supports simultaneous voice and data

calls. The company's modem targeted to the home user, the MultiModem MT2834ZDX (with an estimated street price of \$220) benefits from this technical prowess, but doesn't

offer much to make it a good choice for novice users. Power users, though, will appreciate the proprietary Virtual Modem Driver, which makes it easy to run multiple Win-

dows communications programs simultaneously.

No serial cable is included with the modem, and the manuals lack any illustrations except a single drawing in the Virtual Modem Guide. The modem's ports are labeled, however, and there's a toll-free number for help during setup.

Compact in size, the 1.2-by-4.3-by-5.8-inch MultiModem MT2834ZDX has ten status lights on the front, including speed-level indicators; its power switch is on the side. There is no alphanumeric display. The modem uses an



Ten speed indicators line the front of the MultiModem MT2834ZDX.

AT&T signal converter and a Zilog controller chip.

Software packages bundled with the modem include start-up kits for America Online and CompuServe plus two proprietary Multi-Tech programs, MultiExpress for Windows with Virtual Modem Driver and MultiExpress

REPORT CARD

MultiModem MT2834ZDX

Setup	B
Design	A
Software	B
Performance	C
Service and Reliability	A
Overall value	B

REPORT CARD

Power 28.8 Data/Fax Modem

Setup	A
Design	A
Software	C
Performance	B
Service and reliability	B
Overall value	B

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These amazing color flatbed scanners include **ScanWizard**, Microtek's easy-to-use scanner controller software (which even a first-time user will find simple) and **OCR software** for scanning

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Microtek PageWiz is a personal page scanner for PCs or Windows-based notebooks



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1 Prices mentioned are suggested street prices. 2 \$599 suggested street price does not include optional Transparent Media Adapter (shown on ScanMaker IIHR). The ScanMaker IIHR is a trademark or registered trademark of their respective companies: Microtek, ScanMaker, PageWiz, ImageStar II, and ScanWizard of Microtek Lab, Inc., Windows of Microsoft Corporation, Macintosh III of Apple Computer, Inc., OmniPage Limited Edition of Caere Corporation, Color It! of MicroFrontier, Inc. All other trademarks or registered trademarks are the property of their respective holders. Prices, specifications and software bundles are subject to change without notice. CLPCN090195225PHH

Benchmark Tests: External 28.8 Home Modems

Though it was just over six months ago that we looked at the first V.34 modems off the production line, today we're looking at a mature technology that's moved from the office to the home.

What the Numbers Mean

Not surprisingly, it's tough to pick a clear performance winner among these 28.8-Kbps external modems. The modems here turned in such similar performance results that in most cases the difference between the performance leader and the rest of the pack was only slight. U.S. Robotics' Sportster 28.8 V.34 Faxmodem posted the best performance overall, with the modems from Motorola and Best Data not far behind.

THROUGHPUT VS. FILE TYPE

On this test, which measures a modem's ability to transfer a variety of different file types, the Hayes Accura 288 V.34/V.FC+Fax finished with the best score, slightly ahead of the Motorola Power 28.8 Data/Fax Modem and the U.S. Robotics Sportster. Again, though, less than 1,000 characters per second (cps), or 12 percent, separated the leaders from the also-rans.

TELEPHONE-NETWORK SIMULATION

The U.S. Robotics Sportster managed to post the highest score among the modems, proving that it's a solid performer no matter what the line conditions may be. Yet the difference

between the top performer and the last-place finisher, the SupraFAXModem 288, was less than 500 cps.

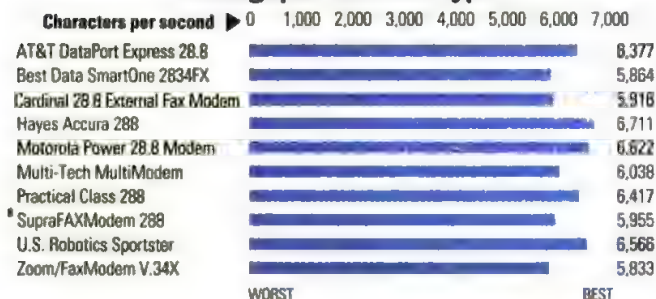
FAX

The best modem on our Fax tests was once again the U.S. Robotics Sportster, which was followed closely by the AT&T DataPort Express 28.8 and then the Best Data SmartOne 2834FX. The Hayes Accura 288 and Practical Peripherals' Practical Class 288 MiniTower II V.34 could not complete our Fax tests because of an incompatibility problem between Delrina's WinFax PRO and the Rockwell chip set used by these modems for Class 1 faxing. The other modems using a Rockwell chip set allowed us to test under Class 2, which avoided the problem. The Hayes modem does not implement Class 2, so it could not complete the tests, while the Practical Class 288 also exhibited a problem faxing under Class 2. Under Class 2, the Practical Class 288 suffered from a problem with the interpage gap—the short silent period that occurs between pages when faxing—which caused the modem to drop the call repeatedly. Keep in mind, however, that both the Hayes Accura 288 and the Practical Class 288 worked fine with the fax software they ship with, so it is possible to use these modems for faxing.—*Analysis written by Bill Flanagan and Jim Wolf*

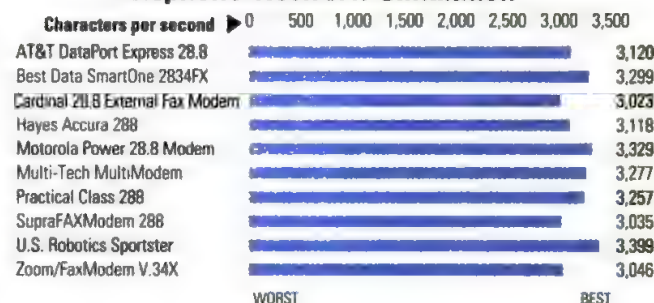
How We Tested

Our test procedures were derived from the EIA/TIA Telecommunications Systems Bulletin TSB-38, a rigorous set of tests designed to challenge a modem's internal hardware and firmware components. Our modem tests measure how fast a modem transfers various file types unidirectionally and bidirectionally, how well a modem works over each of the line conditions you

Throughput vs. File Type



Telephone-Network Simulation



Fax for Windows.

The Virtual Modem Driver lets you assign up to seven different Windows communications applications to their own "virtual" comm ports. Ordinarily Windows allows only one program to use a computer comm port, but the Virtual Modem Driver enables the modem to discriminate the type of call coming in (disting-

uishing a fax signal from a data signal, for example) and then assign the call to the appropriate software and comm port. The driver also makes it

possible to have several communications programs loaded and assigned to virtual ports to save time when reacting to an incoming call or when you

want to make outgoing calls. Most home users won't need to run separate programs for a variety of communications needs, but if you want to load up with remote access, BBS, e-mail, fax, document conferencing, and regular communications software, Multi-Tech's Virtual Modem Driver makes it possible.

The MultiModem MT-

Power users will appreciate Multi-Tech's Virtual Modem Driver, which lets you run multiple Windows communications programs simultaneously.

are most likely to encounter in the Public Switched Telephone Network (PSTN), and how fast and reliably a modem makes a successful connection with a like modem, as well as a Group 3 fax machine.

To simulate the real-life phone lines you might encounter, we used a Telecom Analysis Systems (TAS) Model 240 Voiceband Subscriber Loop Emulator together with a TAS Series II Telephone Network Emulator. If you travel, you have probably experienced the entire spectrum of line quality, and this simulator lets us simulate most of these line conditions. In all, our network-model-coverage tests use 168 different line conditions representing 100 percent of EIA/TIA's model of the U.S.

We loaded our test software—XFR, developed by Satchell Evaluations—on a Dell 486/33 ME. We sent data at 115.2 Kbps using a Hayes dual-port ESP board (NS16550 UART) through the modems and telephone-network simulators either unidirectionally or bidirectionally, and we recorded the throughput rate as data was received at the receiving serial port. The program also checked the integrity of the received data against the sent data to ensure that no bit errors were introduced.

We asked vendors to send us modems with the most recent firmware and to provide information enabling us to create an initialization string that would make each modem perform at its highest potential. All tests involve the transfer of data between two identical external modems from each vendor.

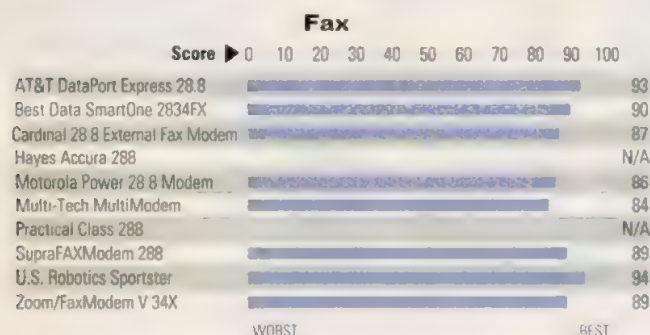
Our **Throughput vs. File Type** test measures each modem's performance as it transmits files representing five different data types: highly compressible graphics, moderately compressible text, slightly compressible executable, incompressible file, and combination file. The results indicate the effectiveness of the vendors' implementations of V.42 error control, V.42bis compression, framing overhead, and dictionary. We configure the TAS units for minimal line impairments. We send each file from one modem to another, retransmitting the file until approximately 1 million bits have passed through the first modem's signal converter, and then measure the

unidirectional throughput. We then repeat the procedure, transmitting copies of the file in both directions at once, and measure the bidirectional throughput. The score we report represents a weighted average of the unidirectional and bidirectional throughput.

The **Telephone-Network Simulation** test measures the effectiveness of a modem's line interface, V.42 error-control algorithm, signal converter, and firmware in handling the wide variety of line conditions possible in our model of the PSTN. The 168 line conditions we used for this test comprise 100 percent of the possible line conditions in the model. The TAS simulators are configured according to the EIA/TIA committee's PSTN profile defined in the TSB-37A. For this test we transfer a highly compressible file with compression disabled to get a clear picture of a modem's ability to work over adverse line conditions. The data is transferred unidirectionally, once over the majority of the line conditions and several times over the most common line conditions. If a modem failed a transfer on a particular line, we attempted a second call. If the modem was unable to connect after a given number of attempts, it received a 0 for that part of the test.

A modem's score on our **Fax** tests is a weighted average of the results of the Fax Throughput Between Modem and Machine test and the Fax Throughput Between Like Modems test. These scores were combined and weighted, with the Fax Throughput Between Modem and Machine score weighing three times that of the Fax Throughput Between Like Modems score to represent the higher frequency of modem-to-machine faxing in a real-world setting. The Throughput Between Modem and Machine test measures the time it takes to send two different files between a modem and a fax machine. The Fax Throughput Between Like Modems test measures the time it takes to send two different files between like-modem pairs across the line simulator.

When running these tests we discovered an incompatibility between WinFax PRO and the timing on the code Rockwell supplied for its chip set. The problem is in evidence with Version 1.2 of the Rockwell code but is fixed in Version 1.3 of the code. The problem manifested itself in the initial negotiation sequence between two fax modems or between a fax modem and a fax machine. The modems began the negotiation at the proper fax speed of 14.4 Kbps. Then they stepped down to 12,000 and then to 9,600, where they leveled off. The fax-modem-to-fax-machine transmission continued downward two more steps, to 7,200 and then 4,800. Changing to Class 2 faxing eliminates the problem. When using a fax modem to send or receive a document, responsibilities for the session are divided between the computer and the modem according to a pair of EIA specifications. Simply put, in Class 1 the computer controls most of the actions involving the document transmission, and in Class 2 the modem takes on much more of the transmission work.



2834ZDX performed well in our on-line service testing under both Windows 3.1 and Windows 95, signing on and maintaining all connections without any problems. In our performance testing, the MultiModem MT2834ZDX posted a below-average Fax score and average scores on the Telephone-Network Simulation and Throughput vs.

File Type tests.

Multi-Tech's ten-year warranty and toll-free technical-support number are both advantageous. Support is available during standard business hours.

If you don't have use for Multi-Tech's Virtual Modem Driver, its above-average price and only average performance don't make a strong

case for its selection. If you do want to load up on communications programs, or have the flexibility to do so in the future, the MultiModem may be your best bet.

MultiModem MT2834ZDX. List price: \$349. Multi-Tech Systems Inc., Mounds View, MN; 800-328-9717, 612-785-3500; fax, 612-785-9874.

Circle 446 on reader service card

Practical Peripherals

Practical Class 288 MiniTower II V.34

You might be attracted to the versatile design of the Practical Class 288 MiniTower II V.34's, but other than this flexibility and good warranty and support hours, this modem has little to rec-

The top half of the image is a vibrant, action-packed illustration for the Battle Beast game. It features a central character, a blue and white armored warrior with a large, glowing yellow lightning bolt emanating from his chest. He is surrounded by various other characters and elements, including a large, muscular figure on the right, a blue, multi-eyed creature on the left, and a green, dragon-like creature at the bottom left. The background is a fiery, orange and red landscape with a dark, silhouetted cityscape in the distance. The overall style is reminiscent of 1990s comic book art or anime.

You've played
Mortal Kombat®, Street
Fighter™ and Primal
Rage,™ but nothing
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power of Battle Beast,™
the ultimate fight game
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Question: What are Mortal Kombat, Street Fighter and Primal Rage? **Answer:** Redundant!

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Game Over!

Visit your retailer for a free demo or download the Battle Beast Promo on AOL (keyword: SEVENTH) or CompuServe (GO: SEVENTH) or on the Web (www.7thlevel.com). For more information or to order, call 1-800-884-8863 ext. 110.

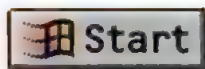
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CIRCLE 378 ON READER SERVICE CARD

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Accelerators. The next generation in Plug and Play graphics cards maximize your performance of Windows® 95. Get the performance you're used to from Diamond. You'll see blazing fast images, striking graphics and quick response rates. With 64-bit technology, the Stealth64 Video Series will boost your system performance while setting the industry standard for speed and resolution. The Stealth64 Video Series also delivers full-motion, full-screen video that won't compromise frame rates or image quality.



Stealth64 Video 3240XL*

Controller: S3 Vision968
Vertical Refresh: To 120Hz
Max. Res.: 1600 x 1200
Memory: 2MB (up to 4MB) VRAM

Stealth64 Video 3200

S3 Vision968
To 120Hz
1600 x 1200
2MB VRAM

Stealth64 Video 2120XL

S3 Vision868
To 120Hz
1280 x 1024
1MB (up to 2MB) DRAM

Hardware MPEG available for Stealth64 Video 3240XL (also available for 4MB 3400XL)
Various Video CODECs supported and Software Drivers included
*Formerly known as Stealth64 Video VRAM



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July, 1995
Stealth64 Video VRAM



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CIRCLE 101 ON READER SERVICE CARD

SUMMARY OF FEATURES

External 28.8 Modems for the Home

	AT&T DataPort Express 28.8	Best Data SmartOne 2834FX	PC MAGAZINE EDITOR'S CHOICE Cardinal 28.8 External Fax Modem	Hayes Accura 288 V.34/V.FC + Fax	PC MAGAZINE EDITOR'S CHOICE Motorola Power 28.8 Data/Fax Modem	Multi-Tech MultiModem MT2834ZDX
Price	\$239 (list)	\$299 (list)	\$179 (street)	\$299 (list)	\$349 (list)	\$349 (list)
General Features						
Signal-converter manufacturer and model	Rockwell RC288DPi R6682-26	Rockwell RC288DPi R6682-21	Rockwell RC288DPi R6682-26	Rockwell RC288DPi R6682-26	Thompson ST7544CFN REV 2-1 B22MB9501	AT&T 1633
Controller-chip manufacturer and model	Silicon Systems SSI 2918	Rockwell L39/U L3902-57	Rockwell L39/U L3903-57	Motorola MC68302	Motorola 68356	Zilog Z182
Firmware version (and date where applicable)	1.00.09	1.3	1.200H	5.4	REV 2 (6/26/95)	209 (5/10/95)
AT firmware version command	ATI1	ATI3	ATI3	ATI7	ATI3	ATI1
Supports flash memory	■	■	■	■	■	■
Supports Caller ID	■	■	■	■	■	■
On-line service start-up kits included	AOL, Imagination Network	AOL, CompuServe, Prodigy	AOL, CompuServe	AOL, CompuServe	AOL, CompuServe	AOL, CompuServe
Other bundled software	QuickLink II Fax for Windows and DOS	Delrina 4-in-1	COMit for Windows and DOS, FaxWorks for Windows	Smartcom Fax for Windows, SmartCom for Windows LE	QuickLink II Fax for Windows and DOS	MultiExpress Fax for Windows, MultiExpress for Windows
Physical Characteristics						
Dimensions (HWD, in inches)	1.5 x 5 x 7	1.5 x 6.3 x 9.5	1.5 x 5 x 5.3	1.4 x 5.8 x 9.6	1.5 x 6.4 x 5.3	1.2 x 4.3 x 5.8
Location of power switch	Back	Back	Back	Back	Back	Side
Location of volume control	N/A	N/A	N/A	N/A	N/A	N/A
Alphanumeric display	■	■	■	■	■	■
Number of status indicators	9	8	8	8	8	10
Speed indicators	■	■	■	■	■	■
Phone cable	■	■	■	■	■	■
Serial cable	■	■	■	■	■	■
Protocols Supported						
ITU data-modulation standards (2,400 bps and faster)						
V.22bis, V.32, V.32bis, V.34	■	■	■	■	■	■
Other high-speed data-modulation standards	V.FC	V.FC	V.FC	V.FC	None	V.32terbo
Synchronous data format	■	■	■	■	■	■
Error-control command sets	V.42, MNP 2-4	V.42, MNP 2-4	V.42, MNP 2-4	V.42, MNP 2-4	V.42, MNP 2-4	V.42, MNP 2-4
Data-compression command sets	V.42bis, MNP 5	V.42bis, MNP 5	V.42bis, MNP 5	V.42bis, MNP 5	V.42bis, MNP 5	V.42bis, MNP 5
Fax compatibility	Group 3	Group 3	Group 3	Group 3	Group III	Group III
Fax standards	Class 1 and 2	Class 1 and 2	Class 1 and 2	Class 1	Class 1	Class 2
Technical Support						
Command-set reference card	■	■	■	■	■	■
Setup guide	■	■	■	■	■	■
Quick-reference card	■	■	■	■	■	■
Technical-support number	800-237-0016	818-773-9600	717-293-3124	800-723-8388, 404-441-1617	800-365-6394	800-972-2439
Technical-support hours (eastern time)	8:00-8:00 M-F, 10:00-6:00 Sat.	11:00-7:30 M-F	8:00-8:00 M-F	8:00-6:00 M-F	8:00-8:00 M-F	9:30-6:00 M-F
BBS number	813-532-5254	818-773-9627	717-293-3074	800-874-2937, 404-446-6336	508-261-1058	800-392-2432, 612-785-3702
Web home page	http://www.parcadyne.att.com	None	None	None	http://www.mot.com/MIMS/ISG	http://www.multitech.com
Warranty	5 years	2 years	Lifetime	2 years (5 years if registered within 90 days of purchase)	5 years	10 years

N/A—Not applicable. The product does not have this feature.

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\$39.95



Both 3.5" disk and CD-ROM included.

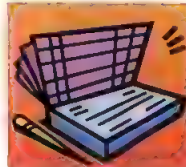
Runs under Windows and Windows 95



Party/Wedding Planner
Make your next party your best party. Organize guest lists and invitations. Track expenses, gifts and thank-you notes.



Phone Book
Put your phone book on line and never lose track of a friend's phone number again. Store phone and fax numbers, and use your modem to dial automatically.



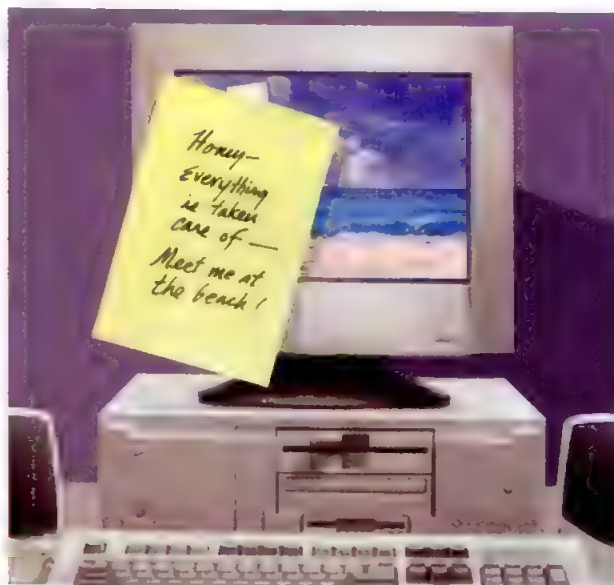
Home Budget
Take control of your income and expenses. Analyze your spending habits. Print checks and keep an on-line register. Develop a budget and then track your progress.



Home Inventory
Record all your valuables for insurance purposes. View belongings by category or location. Estimate replacement costs.



Contact Manager
Track business and social contacts and record each call, letter, fax or meeting you have with each person.



Home Repair
Every home owner knows a house requires constant upkeep. Track repairs, improvements and expenses. Plan for major projects.



Mail List Manager
Organize mailing lists for business or home use. Track business and social acquaintances and print labels for large mailings.



Home Library
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6 1 7 - 2 2 9 - 2 9 2 4 ADQ

Alpha Software Corporation

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TempoNote DX4/100

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- 340MB removable HDD, expandable to 810MB
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- Built-in digital sound chip, speaker, microphone
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Everex TempoNote The perfect portable solution

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TempoNote DX4/100

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- 10.4" Color DSTN display

\$2,180

TempoNote DX4/100

As above, with

- DX4/100 processor
- 8MB RAM, expandable to 20MB
- 520MB removable HDD, expandable to 810MB
- Color TFT display
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28.8 External Modems

Practical Class 288 MiniTower II V.34	SupraFAXModem 288	U.S. Robotics Sportster 28.8 V.34 Faxmodem	Zoom/FaxModem V.34X
\$279 (list)	\$250 (street)	\$279 (list)	\$269 (list)
Rockwell RC288DPI R6682-26	Rockwell RC288DPI R6682-26	Ti 320C51-80	Rockwell RC288DPI R6682-26
Siemens SAB-C501-L40N	Rockwell L39/U L3903-57	Intel 80C180	Rockwell L39/U L3903-57
1.61	1.200-02	6.0.6 (7/21/95)	1.100d
AT13	AT13	AT17	AT13
■	■	■	■
■	■	■	■
CompuServe	CompuServe	ADL, CompuServe, Imagination Network, Prodigy	CompuServe
QuickLink II Fax for Windows and DOS	COMit for Windows and DOS, FaxTalk for Windows	QuickLink II Fax for Windows and DOS	Delrina 4-in-1
1.1 x 4.6 x 6.8	1 x 4.6 x 6.5	1.4 x 6 x 3.8	1.6 x 6.1 x 8.5
Back	Front	Top	Back
N/A	N/A	Side	N/A
■	■	■	■
8	4	7	15
■	■	■	■
■	■	■	■
■	■	■	■
■	■	■	■
V.FC	V.FC	V.FC	V.FC
■	■	■	■
V.42, MNP 2-4	V.42, MNP 2-4, 10	V.42, MNP 2-4	V.42, MNP 2-4, 10
V.42bis, MNP 5	V.42bis, MNP 5	V.42bis, MNP 5	V.42bis, MNP 5
Group 3	Group 3	Group 3	Group 3
Class 1 and 2	Class 1 and 2	Class 1 and 2.0	Class 1 and 2
■	■	■	■
■	■	■	■
■	■	■	■
404-840-9366	503-967-2490	800-342-5877	617-423-1076
8:00-6:00 M-F, 9:00-6:00 Sat., Sun.	9:00-8:00 M-F	9:00-7:00 M-F	8:30 A.M.-11:00 P.M. M-F, 9:00- 5:00 Sat.
404-734-4800	503-967-2444	708-982-5092	617-423-3733
None	None	None	None
Lifetime	5 years	5 years	7 years

REPORT CARD

Practical Class 288
MiniTower II V.34

Setup	B
Design	A
Software	D
Performance	C
Service and reliability	A
Overall value	B

commend it. The Practical Class's estimated street price of \$225 is somewhat on the high side, and the modem's performance doesn't do much to justify the extra cost.

The modem is very small, measuring a petite 1.1 by 4.6 by 6.8 inches when positioned horizontally. Those with even less desk space to spare will want to snap on the included legs to position the modem vertically. The Practical Class 288 has labeled ports and a power switch on the back, and eight status indicators on the front. It's equipped with a Rockwell signal converter and Siemens controller, and is one of only two modems in this test to support distinctive-ring detection, a phone-company option that lets you use more than one phone number on a single phone line. The Practi-



Snap on its legs and the Practical Class 288 becomes a vertical modem.

cal Class 288 doesn't ship with the serial cable you'll need to connect it to your PC, but it was the only modem in this roundup to include a foldout, quick-setup guide.

Its software offerings, how-

ever, are on the slim side. The modem comes with but a single on-line start-up kit—for CompuServe—and a trial version of the software required for the Official Airline Guides.

For fax and communications chores, there's QuickLink II Fax for Windows and DOS.

Though it may be short on on-line start-up kits, the Practical Class 288 proved to be a solid on-line performer. Like the Cardinal modem, the Practical Class 288 successfully connected with all tested on-line services under both Windows 3.1 and Windows 95, even when we inadvertently used a faulty serial cable.

While it was able to pass the Fax tests using its own QuickLink II software, the modem couldn't complete our fax performance tests using Delrina's WinFax PRO. Practical Peripherals' technical support was unable to correct the problem. It had no problem completing other performance tests, though its scores on both the Telephone-Network Simulation and Throughput vs. File Type tests were about average.

The Practical Class's service and support policies are better than most, with a generous lifetime warranty and extended midweek and weekend support hours. Unfortunately, you have to make a toll call for technical support.

If design and support are your overriding concerns, this modem might interest you.

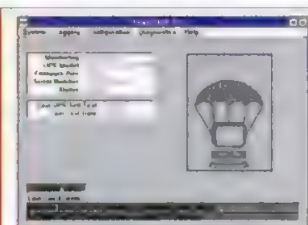
The Practical Class 288 was one of two modems that successfully connected with all tested on-line services under both Windows 3.1 and Windows 95, even when tested with a faulty serial cable.

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All in all, you can't make a bad choice when you choose the company that protects more PC's than all other UPS vendors combined: APC.

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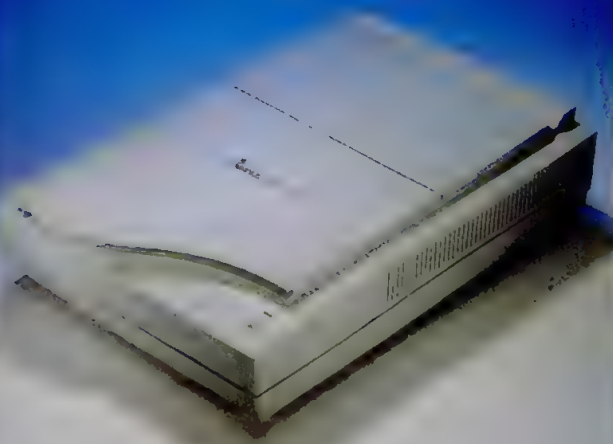
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Tapping into TAPI

Continuing its quest to put information at our fingertips, Microsoft has rolled a sophisticated interface into its Windows 95 operating system that promises to consolidate our data, e-mail, fax, and even voice traffic into one universal inbox that should be easier to manage.

This technology, called TAPI (Telephony Applications Programming Interface), is embedded in the Microsoft Exchange application. Like Microsoft Mail's MAPI (Mail Application Programming Interface), Exchange's TAPI and MAPI support will allow other vendors to build applications that blend transparently with Exchange. That's good news. For users, this should mean that installing a fax program will no longer mean getting used to a whole new interface; switching e-mail programs won't force you to rekey your entire address book. Better yet, with this kind of integration and openness, you should be able to add components at your own pace.

HOW IT WORKS

Here's how it works: When you install Windows 95, it loads a driver for your modem. It also asks you to set up your default location, including voice and fax phone numbers and Internet mail parameters. And that's it, at the basic level. You can send and receive faxes and correspond via the Internet, Microsoft Network, and Microsoft Mail. If

you download a free driver, you will be able to use CompuServe mail.

And here's even better news: Some vendors have announced add-ons to Exchange. These add-ons range from high-end, server-based extensions (including a server product by Microsoft) to programs from companies such as ConnectSoft, Delrina Corp., and Traveling Software that will handle voice mail, improve fax support (offering cover sheets, indexing, and more), improve handling and storage of messages, offer support for every e-mail service under the sun, and provide a TAPI-ready version of LapLink.

NO MORE PORT PROBLEMS

TAPI means even more: the end to comm-port hassles. TAPI-compliant applications can share the serial port gracefully. Leave your fax, voice- and e-mail applications running while you surf the Net; stop surfing and they're still there. There's more: TAPI also means that you don't have to worry about what types of calls you're receiving; it can distinguish between them and send the data to the right place.

And the best news of all is that everything you need to get your modem up and running under TAPI is installed with Windows 95. With a dizzying array of drivers, you're certain to get quick satisfaction.—DAH

Until the problem with Win-Fax PRO is resolved, though, it's tough to recommend the Practical Class 288.

Practical Class 288 MiniTower II V.34. List price: \$279. *Practical Peripherals, Atlanta, GA; 404-840-9966; fax, 404-734-4601.*

Circle 447 on reader service card

Supra Corp.

SupraFAXModem 288

The SupraFAXModem 288 is something of a throwback. It has a retro look, a high \$250 estimated street price, and not much to establish it as a home modem.

An extruded aluminum case with black front and back panels make the SupraFAX-Modem 288 look like a holdover from the 1980s.

There are two-character LED indicators with four status lights and a spring-loaded push-button power switch on front; the ports are labeled on the back of the modem. Based on Rockwell signal converter and controller chips, the Supra also includes some high-end features, such as Caller ID hardware support, a silent answer mode, flash ROM for easy upgrading of firmware as speed standards change, and nonvolatile configuration settings. A welcome touch: It also includes both a serial cable and the 9-pin-to-25-pin adapter you may need to hook the modem up to an older PC.

If you're anxious to get up and running, you'll appreciate the getting-started manual,

REPORT CARD

SupraFAXModem 288

Setup	A
Design	B
Software	D
Performance	C
Service and reliability	B
Overall value	B

the extended hours of toll-free technical support, and the five-year warranty. What you won't like is the skimpy selection of software. Your choices are limited to FaxTalk for

Windows, COMit for DOS and Windows, and a CompuServe start-up kit.

The modem successfully completed our on-line connections tests, though it initially

experienced some difficulties connecting to Lotus Notes via direct dial-up to a Notes server on both the Windows 3.1 and Windows 95 test machines. Supra Corp. supplied a driver that enabled fault-free connections from both versions of Windows; if you have any intention of dialing in to Notes, be sure to call Supra to get the right driver.

The SupraFAXModem 288 didn't have any difficulties completing the performance side of our tests, but it didn't shatter any speed records either. In its best showing, it tied for fourth place on the Fax tests. Its scores on the Telephone-Network Simulation and Throughput vs. File Type tests were both near the bottom of the pack.

For a better bargain, you might want to take a look at the new SupraExpress 288.



Its extruded aluminum case gives the SupraFAXModem a retro look.

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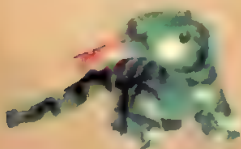
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CIRCLE 256 ON READER SERVICE CARD

Sister Mary Josephine

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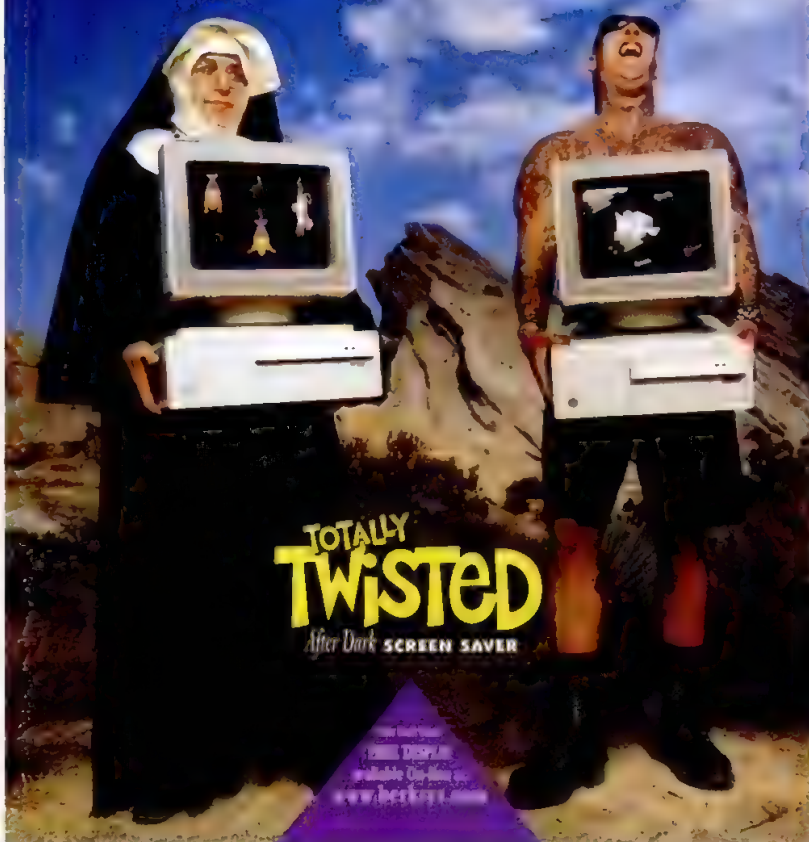
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DeluxScan 21	21"	0.28	1600 x 1280	✓

* EPA Energy Star, MPR II and DPMS.

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CIRCLE 170 ON READER SERVICE CARD



28.8 External Modems

For around \$170 you'll get the same core hardware offered in the SupraFAXModem 288, minus the flash ROM and other high-end features.

SupraFAXModem 288. *Estimated street price: \$250. Supra Corp., Vancouver, WA; 800-727-8772, 360-604-1400; fax, 360-604-1401.*

Circle 448 on reader service card

U.S. Robotics Inc.

Sportster 28.8 V.34 Faxmodem

If superior performance is a high priority on your list, U.S. Robotics' Sportster 28.8 V.34 Faxmodem may be the choice for you. While its estimated street price of \$220 is somewhat higher than the average in this roundup, the Sportster offers top throughput and reliable connections.

Fairly compact at 1.4 by 6 by 3.8 inches, the Sportster has its power switch on top; a volume-control dial is on the side (the Sportster is the only modem in this roundup with this feature). There are no speed indicators or alphanumeric displays, but the modem offers seven status-indicator lights on the front and labeled ports on the back. The Texas Instruments signal converter and Intel controller chip include nonvolatile configuration settings (so the modem retains changes to its settings when you turn it off) and Caller ID hardware support. The Sportster was also one of

plete with a toll-free technical-support number) stuck to the bottom of the modem, so there's no need to scour the manual for setup help. The modem also includes a five-year warranty.

The Sportster offers a good selection of on-line service start-up kits, including those for America Online, CompuServe, Prodigy, and The Imagination Network (AT&T's games and entertainment service), as well as QuickLink II Fax for Windows and DOS for handling general communications and fax tasks.

You'll be happy to know



For speedy file transfers, consider the Sportster 28.8 V.34 Faxmodem.

that all these start-up kits work perfectly; the Sportster had no problems making connections in our on-line tests under either Windows 3.1 or Windows 95. It also turned in stellar results on our performance tests. It placed first on both the Fax and Telephone-Network Simulation tests, and third on the Throughput vs. File Type test.

Winning the nod for the fastest performance on our tests, the U.S. Robotics Sportster 28.8 V.34 model is a good choice, particularly if you want excellent throughput or if you live in an area with less-than-

optimal telephone lines. It may be a little bit on the pricey side, but you truly get what you pay for with this one.

Sportster 28.8 V.34 Faxmodem. *List price: \$279.*

REPORT CARD

Sportster 28.8 V.34 Faxmodem

Setup	B
Design	B
Software	A
Performance	A
Service and reliability	B
Overall value	B

U.S. Robotics Inc., Skokie, IL; 800-342-5877, 708-676-7010; fax, 708-676-7320.

Circle 449 on reader service card

Zoom Telephonics Inc.

Zoom/FaxModem V.34X

The Zoom/FaxModem V.34X is another average-value modem, with a slightly higher-than-average \$219 estimated street price and slightly below-average performance numbers. Its dearth of on-line start-up kits doesn't make this one any easier to recommend.

The Zoom is a mixed metaphor when it comes to design. At 1.6 by 6.1 by 8.5 inches, it's larger than most modem's manuals and takes

up lots of valuable desk space. But its front panel offers 15 informative status lights, including speed indicators (which most of the other modems in the roundup are lacking); the back

of the modem contains a power switch and labeled ports. The Rockwell signal converter and controller chip include nonvolatile configuration settings (so that it retains your changes when you turn it off) and support for Caller ID hardware. The serial cable you'll need to hook up the modem to your PC is not in-

cluded, though the modem does include a Quick Start Guide to help you set it up.

Software, too, is a mixed bag. The Zoom comes with a single start-up kit, for CompuServe, but a generous bundle of communications and fax software. Delrina's WinFax Lite, DOSFax Lite, and COMit Lite for DOS and Windows should cover all your communications and faxing needs.

The Zoom/FaxModem V.34X was successful in making all Windows 3.1 and Windows 95 on-line connections. It fared less impressively on our performance tests, earning a tie for fourth place on the Fax tests, an eighth-place finish on the Telephone-Network Simulation test, and a disappointing tenth place

on the Throughput vs. File Type test. In everyday usage, you should have no real problems with this modem, but don't expect it to work very quickly—particularly over impaired

phone lines.

Zoom Telephonics' longer-than-average seven-year warranty is offset by the fact that technical support requires a toll call. Technical support is available for extended hours, however, both midweek and on Saturday.

With lower-than-average technical performance, and a slightly higher-than-average price, there's just not much to distinguish the Zoom/FaxModem V.34X from the rest of the pack. □

Zoom/FaxModem V.34X. *List price: \$269. Zoom Telephonics Inc., Boston, MA; 800-666-6191, 617-423-1072; fax, 617-423-3923.*

Circle 450 on reader service card



You'll find speed indicators on the front of the Zoom/FaxModem V.34X.



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Coming Up

12th Annual Printer Blockbuster

E-mail and electronic documents may eventually take over the world, but until that day most of us will still need to produce documents the old-fashioned way: on paper. So we present our 12th annual printer blockbuster issue, a compendium of more than 100 of the newest printers in every key printer category. Whether you're looking for a workgroup laser for the office, a low-cost printer for your home PC, a color graphics printer, or one of the latest color laser printers, we'll give you the performance data, comparisons of output quality, and hands-on user information you'll need to make an informed choice.

Personal Laser Printers

If you need monochrome output for your desktop, laser printing is still the technology of choice for crisp, clean text and graphics. Personal laser printers have continued to come down in price (some are less than \$400), and manufacturers have raised the bar in print speed and resolution.

Workgroup and Network Lasers

As with personal lasers, speed is increasingly affordable, and 600-dpi resolution is becoming the standard in the network laser market. And the best units now offer 1,200-dpi output. But the biggest news is in the software. New remote-management utilities give end users and network administrators unparalleled control over the printer and print jobs right from their desktops.

Color Printers

The fastest-growing market segment is still color-capable printers. Now business and even home users are discovering they can get great color for the same price as good monochrome output. We cover the three major categories: ink jet, color laser, and color graphics printers.

Dot Matrix

If you print on multipart forms or need lightning-quick, high-volume output, impact printers are still your best choice.

Service and Reliability

We surveyed over 7,000 readers for our annual study on service and reliability. Find out how our readers rated the top printer vendors in terms of reliability, customer service, and repair experience. Would they buy a printer from a given company again? Should you?

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NE—Network Edition.

To obtain the Network Edition of *PC Magazine*, call Circulation at 800-289-0429.

Abort, Retry, Fail?

THE LIGHTER SIDE OF PERSONAL COMPUTING

By Don Willmott

The Worst Novel of All Time?

Here are three randomly selected passages from Pocket Books' *DOOM: Knee-Deep in the Dead*, a novelization of the ultraviolent game.



"I raised my rocket launcher and let the first hell-prince have it at forty meters. The blast blew the motherless bastard backward, but it got to its feet. I couldn't believe it!"

"They pointed their clawed hands at me; but instead of the usual balls of flaming snot, these 'demons' fired green energy pulses out of wrist-launchers."

"As was the usual case after a good killing, we took advantage of the opportunity to do more sightseeing."

What this ad from  *The Stigler* (Oklahoma) *News-Sentinel* doesn't say is that the job comes with a free sledgehammer.

KEOTA PUBLIC SCHOOLS

Position Available
SECRETARY
Computer Skills Required



Richard Tennant

If your entry is used, we'll send you \$50 and a *PC Magazine* T-shirt. Send your entries to Abort, Retry, Fail?, *PC Magazine*, One Park Ave., New York, NY 10016-5802. Winners this issue: Sam Busuito, Frank Bradley Ong, Fiona Rochester, and Doug Wilson.

Coming Soon: Barbie for Windows 95

During an interview for a Hong Kong-based magazine, Corel CEO Michael Cowpland told the reporter that prior to running Corel, he had been the co-founder of "Mitel, a telecommunications company." When the article appeared in print, it said he was the cofounder of "Mattel, a very large toy communications company."

Surf the Web to 
<http://streams.com/pierce> to play *Piercing Mildred*, an interactive "body modification" game in which you work with a \$100 budget to pierce and scar your body inventively. But be careful: It costs \$5 to cure an infection.



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"For sale: IBM compatible, 486SX, 33 MHC, 2 Maryboy ram, 212 hard drive... sega color monitor."—*TRADIN' TIMES* (DEARBORN HEIGHTS, MICHIGAN)

And Yet Another Tree Falls

GreenSoft, which sells a document management program called GreenDesk, is an environmentally conscious company. Its pledge: "GreenSoft is committed to reducing dependence on paper-based information management and its corresponding depletion of the life-giving forest resources." So why does the back of the GreenDesk manual include five pages marked "This page left intentionally blank"?

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*The VeriTest Cross-Country v2.0 test simulates typical executive use of Microsoft Office® applications in Microsoft Windows® 3.11 during an airplane flight. Power management was enabled and 8MB RAM was installed. VeriTest, inc. is located in Santa Monica, CA. Promotional pricing is not countable.

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Dell's featured digital artist is Sanjay Kothari of New York, NY.